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Results of Ground-Water Monitoring for Radionuclides in the Separations Area - 1987

John A. Serkowski
Albert G. Law
Jeffrey J. Ammerman
Aaron L. Schatz

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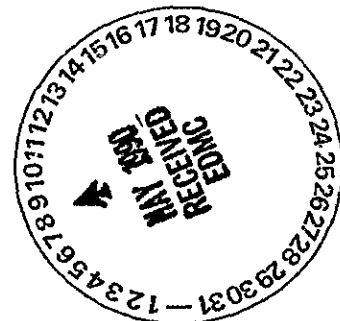
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Westinghouse
Hanford Company

P.O. Box 1970
Richland, Washington 99352

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EXECUTIVE SUMMARY

The purpose of this report is to present a summary of the results for calendar year 1987 of the Westinghouse Hanford Company (Westinghouse Hanford) ground-water monitoring program for radiological constituents in the Separations Area of the Hanford Site. This monitoring program is implemented to partially fulfill the U.S. Department of Energy (DOE) requirement in DOE Order 5484.1 that radioactivity in the environment be monitored. The program is also used to monitor operating disposal facilities for compliance with DOE requirements.

The Separations Area radionuclide ground-water monitoring program is coordinated with other ground-water monitoring activities on the Hanford Site conducted by Westinghouse Hanford and Pacific Northwest Laboratory (PNL). The PNL program includes sampling for both radioactive and nonradioactive chemicals throughout the Site (including 100 and 300 Areas) and is responsible for estimating and evaluating the impact on ground water to the general public from all operations at the Hanford Site. Ground water characterization and monitoring for compliance with Resource Conservation and Recovery Act (RCRA) is also being conducted at facilities on the Hanford Site. Results of PNL and RCRA monitoring activities are reported elsewhere.

The objectives of the Separations Area monitoring program are to (1) assess the quality of ground water beneath the Separations Area for compliance with Westinghouse Hanford and DOE guidelines, (2) evaluate the performance of Westinghouse Hanford's disposal and storage sites in the Separations Area, (3) determine the impact of waste disposal operations in the 200 Areas on the ground water, and (4) provide data for hydrologic analyses and model applications.

The 1987 Separations Area unconfined aquifer monitoring network included 149 wells. Water samples were collected monthly, quarterly, or semiannually from the wells in the network. These samples were selectively analyzed for total alpha, total beta, tritium (^3H), ^{90}Sr , ^{137}Cs , ^{60}Co , ^{106}Ru , uranium, and nitrate. In general, average radionuclide concentrations in monitoring wells during 1987 were similar to 1986 levels.

Water levels were measured in 200 wells to produce water-table maps of the Separations Area.

Radionuclide concentrations in the ground water are compared with administrative control limits (ACL) established by Westinghouse Hanford as guidance for operational purposes (Part L of RHO-MA-139, *Environmental Protection Manual*). These ACL apply to the level of contamination in the ground water beneath a waste site. The ACL are based on meeting drinking water standards at the end of institutional control (assumed to be in the year 2150 AD), which is in accordance with Westinghouse Hanford's philosophy to reduce contaminant levels in the environment to as-low-as-reasonably-achievable (ALARA).

The radionuclide concentrations in the ground water are also compared with the interim derived concentration guides (DCG) as directed by DOE. The DCG were developed to establish the maximum allowable radiation exposure to the public at 100 mrem/yr for occasional exposure expected to last longer than 5 yr. Note that the DCG are applicable at the point of actual exposure to members of the public; therefore, they are not applicable to the Hanford Site proper. For reference, observations are made in this report relating how the concentration of a radionuclide in ground water at a waste site compares with the DCG. Therefore, this comparison is conservative as it neglects the time for ground water to reach the point of exposure to the public with the attendant sorption, dispersion, dilution, and radioactive decay.

Guidelines in the ground water beneath active liquid waste disposal facilities were exceeded in the following cases:

- Tritium concentrations in the ground water exceed the DCG and the ACL at the 216-A-10 Crib (deactivated in January 1987), the 216-A-36B Crib (currently in the closure process), the 216-A-45 Crib (which replaced the 216-A-10 Crib) and the 216-A-37-1 Crib. Based on previous experience, the concentrations are expected to be below the DCG by the time the ground water beneath these cribs reaches the Columbia River. The average tritium concentrations increased by about 30% over those reported in 1986. Concentrations of ^{129}I also exceeded the administrative control limits (ACL), though not the DCG, in wells at the 216-A-10 and 216-A-36B Cribs.
- The average ^{90}Sr concentration in two wells at the 216-A-25 Pond exceeded the ACL in 1987, but was below the DCG. This contamination was localized and at levels similar to those reported in 1986. The pond was decommissioned in 1987.
- The concentration of ^{234}U exceeded the ACL in two wells at the 216-B-62 Crib, but was below the DCG. One of those wells also showed levels of ^{238}U above the ACL but below the DCG. Uranium concentrations in 1987 were slightly lower than those in 1986. An investigation indicated that the contamination originates from the nearby inactive 216-B-12 Crib rather than from disposal to the 216-B-62 Crib.

Guidelines were exceeded in the ground water beneath inactive liquid waste disposal facilities in the following cases:

- The ^{90}Sr concentration exceeded the DCG and the Westinghouse Hanford ACL at the inactive 216-B-5 reverse well. Because ^{90}Sr is readily sorbed on sediment, the concentration of ^{90}Sr from the reverse well is expected to be below the DCG at the Columbia River. The concentration of ^{137}Cs exceeded the ACL but was below the DCG. The ^{90}Sr and ^{137}Cs concentrations were similar to those for 1986.
- The concentration of ^{99}Tc exceeded the ACL, but not the DCG, in a single sampling from well 299-E33-07 near the inactive 216-B-48/49/50 Cribs.
- Concentrations of ^{234}U and ^{238}U remained above the DCG and the ACL in the ground water at the inactive 216-U-1/2 Cribs. Modeling of ground-water flow and transport indicates the DCG will not be exceeded at the Columbia River. The concentrations in the seven monitoring wells have stabilized since completion of the remedial pumping and treatment in 1985. The ACL, but not the DCG, for ^{99}Tc is also exceeded in one of the wells monitoring the 216-U-1/2 Cribs.
- The concentrations of ^{234}U and ^{238}U exceeded the ACL, but were below the DCG in one well at the 216-U-10 Pond. The concentrations are similar to those for 1986. The 216-U-10 Pond was deactivated in 1984.
- The total uranium concentration in the well monitoring the inactive 216-U-8 Crib exceeded the ACL for ^{234}U , but remained below the DCG, after increasing steadily during 1987.

Although the 216-U-8 Crib received large quantities of uranium during its operation, the current increase may be due to movement of contamination from the 216-U-1/2 Crib area.

- The concentration of ^{129}I exceeded the ACL, but was below the DCG in well 699-35-70, located east of 200 West Area. The ^{129}I is a result of discontinued past operations in 200 West Area.

Nitrate is a common substance in effluent streams, and because of its mobility in ground water is useful, along with tritium, as an indicator of the extent of ground-water contamination. Maps showing the extent of the nitrate and tritium plumes are included in this report.

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1.0 INTRODUCTION

1.1 BACKGROUND

The U.S. Department of Energy (DOE) Hanford Site is located in south-central Washington State, approximately 170 mi (270 km) southeast of Seattle and 125 mi (200 km) southwest of Spokane (Figure 1). The Hanford Site is used, in part, for nuclear reactor operation, reprocessing of spent fuel, and management of radioactive waste. The fuel reprocessing and radioactive waste management facilities in the 200 East and 200 West Areas are operated by Westinghouse Hanford Company (Westinghouse Hanford) for DOE.

This report addresses radiological constituents in the ground water beneath the Separations Area (Figure 1 and Appendix A), which has been designated as an area of interest for ground-water monitoring purposes. The Separations Area encompasses all of the liquid waste disposal facilities associated with processing in the 200 East and 200 West Areas. Westinghouse Hanford maintains a program for monitoring radionuclides in the ground water beneath the Separations Area as part of its waste management responsibility. This monitoring program, based on the requirements of DOE Order 5484.1, *Environmental Protection, Safety, and Health Protection Information Reporting Requirements*, focuses on evaluating the impact on the aquifer of radioactive liquid waste discharged to the ground, as specified in DOE Order 5480.1B, *Environment, Safety and Health Programs for DOE Operations* (DOE 1986).

The Separations Area radionuclide ground-water monitoring program is coordinated with other ground-water monitoring activities on the Hanford Site conducted by Westinghouse Hanford and Pacific Northwest Laboratory (PNL). The PNL program includes sampling for both radioactive and nonradioactive chemicals and is responsible for estimating and evaluating the impact on ground water to the general public from all operations at the Hanford Site. A discussion of the ground water for the entire

Hanford site, including the impacts of 100 Area and 300 Area liquid waste disposal, is found in the PNL annual environmental monitoring report (PNL 1988). Ground-water characterization and monitoring for compliance with the Resource Conservation and Recovery Act (RCRA) is being conducted at the Transportable Grout Facility near 200 East Area, 183-H Solar Evaporation Basins in the 100H Area, 300-Area Process Trenches, Solid Waste Landfill, and Non-radioactive Dangerous Waste Landfill. Detailed results of these RCRA activities will be available in forthcoming reports from Westinghouse Hanford and PNL.

Westinghouse Hanford maintains an environmental monitoring program dealing with air, soil, vegetation, surface water, and ground water and also issues an annual report (Elder et al. 1988). The present report expands on the ground-water monitoring results from the Separation Area reported in the annual environmental report.

Radionuclide concentrations in the ground water are compared with Westinghouse Hanford operating limits, as defined in Part L of RHO-MA-139, *Environmental Protection Manual* (Rockwell 1987) and with DOE guidelines. The Westinghouse Hanford limits have been established with the goals of assuring that radioactive contamination in the ground water is as-low-as-reasonably-achievable (ALARA) (DOE 1986) and of meeting drinking water standards (EPA 1976) at the end of institutional control (assumed to be in the year 2150 AD).

1.2 PURPOSE AND OBJECTIVES

The purpose of this report is to present ground-water data collected in the Separations Area during calendar year (CY) 1987 and to denote the impacts of Westinghouse Hanford processing operations in the 200 Areas on the unconfined aquifer. The scope of this report is limited to radionuclide data only, with the exception of nitrate, which historically has been reported because it is useful for indicating the maximum extent of contamination.

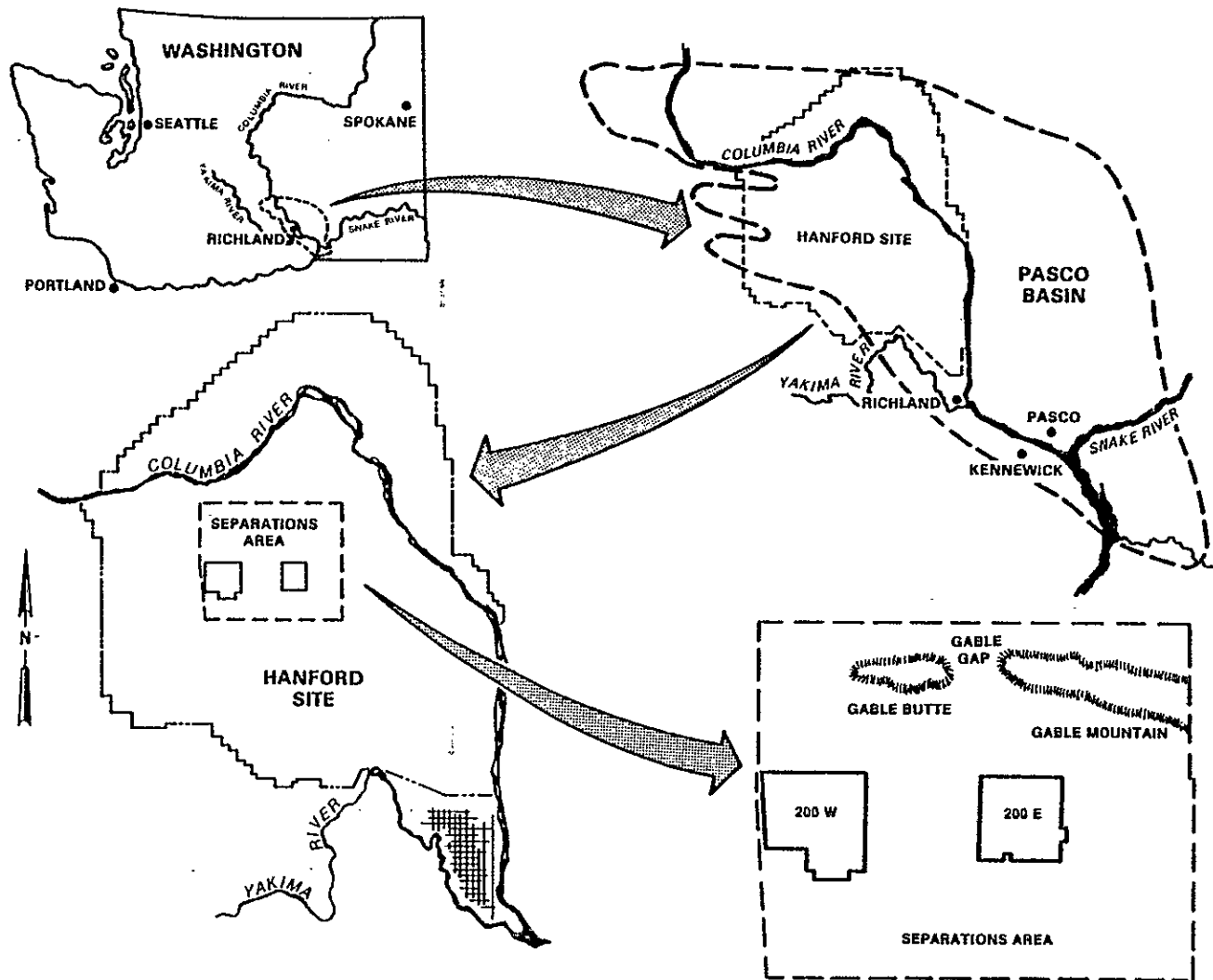


Figure 1. Separations Area Location Map.

Nonradioactive chemical data for the ground water are collected and reported this year by PNL (PNL 1988).

The objectives of the Westinghouse Hanford ground-water monitoring program in the Separations Area are as follows:

- Assess the quality of ground water in the Separations Area for compliance with Westinghouse Hanford and DOE radionuclide guidelines.
- Evaluate the performance of Westinghouse Hanford disposal and storage sites in the Separations Area.
- Determine the impact of radioactive waste disposal operations in the 200 Areas on the ground water.
- Provide data for hydrologic analysis and model application. To complement the water quality data obtained by sampling and analyses, water-table contour maps are developed to provide basic information on the directions and rates of ground-water flow.

The Plutonium and Uranium Extraction (PUREX) Plant and associated facilities which dispose of liquid effluent in the 200 Areas continued operation in 1987. This annual report discusses ground-water monitoring results at each of the active liquid-waste disposal sites in the 200 Areas during CY 1987. Additionally, the condition of the ground water beneath selected inactive liquid waste disposal sites, where previous disposal has impacted the aquifer, is presented.

1.3 GEOHYDROLOGY

Detailed documentation of the geology and hydrology of the Separations Area is reported in *Geology of the Separations Areas, Hanford Site, South-Central Washington* (Tallman et al. 1979), *Hydrology of the Separations Area* (Graham et al. 1981), and *Hydrologic Studies within the Columbia Plateau, Washington: An Integration of Current Knowledge* (Gephart et al.

1979). These reports are summarized in the following paragraphs.

The Hanford Site is located within the Pasco Basin, a structural and topographic basin (see Figure 1) with boundaries defined by anticlinal structures of the basalt. Three main geologic units are located beneath the Hanford Site: in ascending order, the Columbia River Basalt Group, the Ringold Formation, and the glaciofluvial sediments. The Columbia River Basalt Group, composed of the Grande Ronde Formation, the Wanapum Formation, and the Saddle Mountains Formation, is a thick sequence of basalt flows extruded from fissures during the Miocene epoch. The Ringold Formation, a Pliocene fluvial sedimentary unit, overlies the Columbia River Basalt Group except in areas where erosion has removed these sediments. The Ringold Formation is subdivided into four units (on the basis of texture), which are, in ascending order, the Basal Ringold unit (sand and gravel), the Lower Ringold unit (clay, silt, and fine sand with lenses of gravel), the Middle Ringold unit (occasionally cemented sand and gravel), and the Upper Ringold unit (silt and fine sand). The glaciofluvial sediments, informally named the Hanford Formation, were deposited on top of the Columbia River Basalt Group and the Ringold Formation during the Pleistocene epoch. The Hanford Formation consists of unconsolidated coarser sands and gravels overlain by finer-grained sands and silts with a combined thickness of 100 to 250 ft (30 to 75 m) on the 200 Area plateau.

1.3.1 Occurrence of Ground Water

The unconfined aquifer is affected by disposal of waste water to surface and subsurface disposal sites. The depth to ground water is dependent on topography and the extent of the water table mounding caused by waste-water disposal. The 200 Areas are located on an elevated plateau where the top of the aquifer lies from 180 to 340 ft (55 to 105 m) below the surface. North and east of this plateau the depth to ground water decreases significantly from 125 ft (40 m) at B-Pond to 25 ft (8 m) at the deactivated Gable Mountain Pond. The

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unconfined aquifer is contained within the Ringold Formation and the overlying Hanford Formation. Beneath the unconfined aquifer is a confined aquifer system consisting of sedimentary interbeds or intraflow zones that occur between dense basalt flows or flow units. The bottom of the unconfined aquifer is the uppermost basalt surface or, in some areas, a clay zone of the Ringold Formation. The thickness of the unconfined aquifer in the Separations Area varies from less than 50 ft (15 m) to over 230 ft (70 m).

The principle source of natural recharge to the unconfined aquifer is rainfall runoff from areas of high relief to the west of the Hanford Site, which feeds the ephemeral streams, Cold Creek and Dry Creek. From these recharge areas, the ground water generally flows eastward and discharges into the Columbia River (see Plate 1). In the Separations Area this flow pattern is modified by basalt outcrops and subcrops and by artificial recharge.

The unconfined aquifer beneath the Separations Area receives artificial recharge from liquid disposal areas. Cooling water disposed to ponds has formed ground-water mounds beneath three high-volume disposal sites: U-Pond in 200 West Area, B-Pond east of 200 East Area, and Gable Mountain Pond north of 200 East Area (Figure 2). Compared with pre-Hanford conditions (Newcomb et al. 1972), the water table has risen approximately 35 ft (11 m) under B-Pond and 15 ft (4.5 m) near Gable Mountain Pond. The water table under U-Pond rose approximately 65 ft (20 m) while it was in operation, although it has declined about 8 ft (2.5 m) from that level since the pond was deactivated in 1984. Gable Mountain Pond was deactivated in late 1987 and has been completely backfilled.

1.3.2 Aquifer Properties

Large differences in aquifer properties are evident between the Hanford Formation and the middle member of the Ringold Formation, the major units of the unconfined aquifer. Hydraulic conductivities range from 10 to 230 ft/day (3 to 70 m/day) for the middle Ringold unit

and from 2,000 to 10,000 ft/day (600 to 3,000 m/day) for the Hanford Formation.

Transmissivity increases from the 200 West Area to the 200 East Area. This transmissivity increase is a result of two factors: the saturated thickness of the aquifer is greater (the result of a drop in the basalt surface), and more of the unconfined aquifer is contained within the more permeable Hanford Formation.

1.3.3 Flow Dynamics

Ground-water flow is perpendicular to the water-table contours delineated in Figure 2. Flow patterns are dominated by ground-water mounds under B-Pond and the deactivated U Pond. Flow from 200 West Area is primarily toward the east. The flow system in 200 East Area is complex due to changes in aquifer thickness and hydraulic properties, the influence of B-Pond, and the basalt subcrops and structures of Gable Mountain and Gable Butte. The flow from 200 East Area and environs is northward through Gable Gap (between Gable Butte and Gable Mountain) and also southeastward toward the Columbia River. Radial flow from the mound under B-Pond is channeled to the north, east, and southeast by the flow regime in 200 East Area. These flow patterns are reflected in the Separations Area total beta, tritium, and nitrate plume maps included in this report.

1.3.4 Contaminant Transport

Contaminants in ground water move along flow paths that are perpendicular to water table contours. The concentration of contaminants may be attenuated by factors within the geohydrologic system: sorption, dispersion, and dilution. For radiological constituents, the concentration may also be reduced by radioactive decay depending on the half-life of the radioisotope.

Sorption is the process by which contaminants are chemically bound to the surface of sediment particles in the subsurface environment. A measure of sorption is the distribution coefficient, K_d , which describes the

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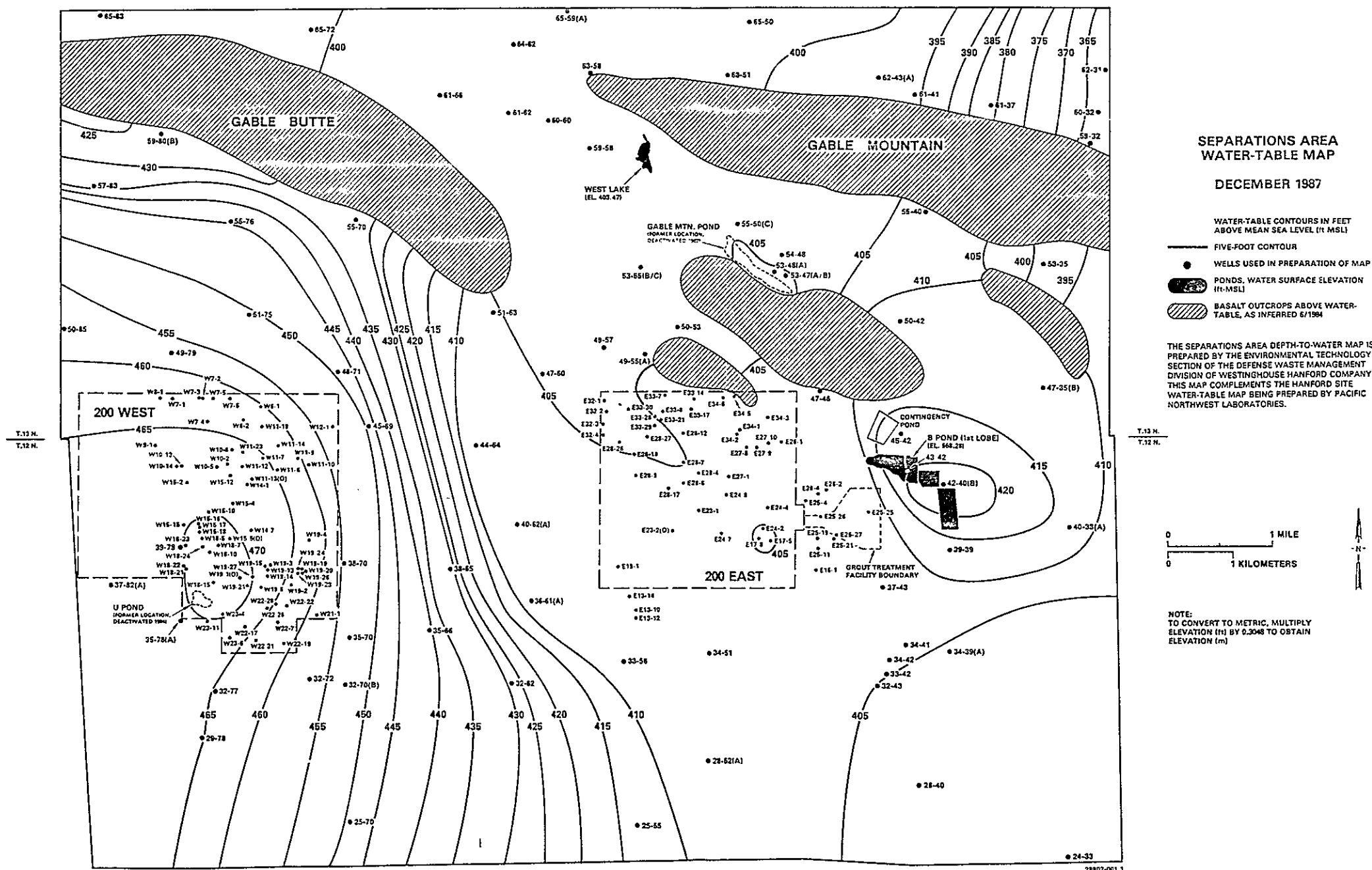


Figure 2. Separations Area Water-Table Map, December, 1987.

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partitioning of a solute between liquid and solid phases in the subsurface environment (Freeze and Cherry 1979). A small K_d value indicates that the solute would move with ground water; that is, the solute would be very mobile. A large K_d value would denote that the solute is essentially immobile; that is, it would be sorbed on the sediment particles. The distribution coefficient is a function of the ion involved, the mineralogy of the sediments, and the chemistry of the solution. For example, tritium and nitrates are considered mobile because neither is sorbed by the soil, while plutonium is readily absorbed by sediments and is immobile.

Dispersion is the process whereby ground-water contaminants are spread out along the flow path because sediment particles serve as obstacles to flow. Dispersion is primarily a mechanical process.

The process of dilution occurs when water containing contaminants mixes with cleaner water resulting in a decrease in contaminant concentration.

The concentration of radioactive contaminants in a plume may be reduced over time by the natural decay of the radioisotopes. The half-life of a radioisotope is the time required for a quantity of radioactive material to decay to one-half of its activity. The concentration of a radioisotope will be reduced to 1% of the original concentration in less than seven half-lives.

The mechanisms of sorption, dispersion, dilution, and radioactive decay attenuate the concentrations of radionuclides disposed of to the sediments at the Hanford Site. Thus, concentrations of contaminants at any downgradient location are lower than when disposed of in a liquid waste site.

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2.0 SEPARATIONS AREA GROUND-WATER MONITORING PROGRAM

The ground-water monitoring network was established to observe the radiological quality of the ground water beneath waste storage and disposal facilities in the Separations Area. The network is composed of one or more wells located downgradient from all active and major inactive liquid waste sites. Primary concerns in the operation of the monitoring program include the location of monitoring wells relative to the sites, the identification of radionuclides to monitor, the collection of representative ground-water samples, and the use of appropriate analytical techniques to obtain concentration values. The monitoring program is also responsible for identifying any condition that might enhance subsurface migration of contaminants.

2.1 WELL NETWORK

The routine unconfined aquifer radionuclide monitoring network for CY 1987 was comprised of 149 wells, a net increase of 12 from 1986 (Law et al. 1987, Appendix B.1). Fourteen monitoring wells were added and two deleted from the 1986 network (Table 1). Well 299-W21-01 was removed from the schedule because no contamination has been detected there and it is not directly associated with a waste disposal facility, while 299-W18-19 can no longer be sampled because the water table has dropped below the bottom of the screen. A brief discussion of the well numbering and facility numbering systems is presented in Appendix A, in addition to a map identifying the perimeter of the Separations Area as used in this report, maps showing well locations, and drawings showing the location of monitoring wells at disposal facilities.

2.1.1 Well Construction

Monitoring wells are normally 6 to 8 in. (15.2 or 20.3 cm) in diameter. Most of the wells in the ground-water monitoring network are constructed of carbon-steel casing. However, during 1986, the design of wells was revised to incorporate the use of stainless steel for the primary casing to permit sampling for nonradioactive constituents that be may leached from or absorbed to the casing material if carbon steel were used. An essential feature in new well construction is the use of grout, either bentonite or cement, to seal the annular space between the well casing and the soil to prevent the migration of contaminants down the outside of the well casing.

The outmoded construction method using carbon-steel casing may be referred to as the "old" method. (This method is also used for the renovation of older wells that were not sealed when constructed.) The construction process can be discussed in three stages (Figure 3). Stage 1 shows the emplacement of the outer casing of the well from the ground surface to the desired depth. Stage 2 involves perforation of the outer casing and emplacement of a smaller-diameter liner casing inside the outer casing. The bottom end of the liner casing contains a packer and is flared to be flush with the outer casing to reduce the chance of pumps or down-hole tools catching on the lip during removal from the well. Finally, in stage 3 the well is grouted by placing grout in the annular space between the liner casing and outer casing, which also flows through the perforations to seal the outside of the casing against vertical migration of contaminants.

To ensure the integrity of wells, a program of well renovation was continued in 1987. This work addresses older wells that are not adequately sealed and are located within 300 ft (91 m) of liquid waste disposal sites. Without

Table 1. List of Changes to Routine Well Monitoring
Network in CY 1987.

Wells added		Wells deleted	
Well no.	Waste site	Well no.	Waste site
299-E24-11 ^a	216-A-10,38	299-W18-19	216-Z-20
299-E25-02 ^a	216-A-1, 7	299-W21-01	200 West Area
299-E28-07 ^a	216-B-5		
299-E28-24 ^a	216-B-5		
299-E28-25 ^a	216-B-5		
299-W22-10 ^a	216-S-1, 2		
299-W22-18 ^a	216-S-8		
699-45-42 ^a	216-B-3 Contingency Pond		
299-W19-19 ^b	216-U-17 ^c		
299-W19-23 ^b	216-U-17 ^c		
299-W19-24 ^b	216-U-17 ^c		
299-W19-25 ^b	216-U-17 ^c		
299-W19-26 ^b	216-U-17 ^c		
299-W19-27 ^b	216-U-14		

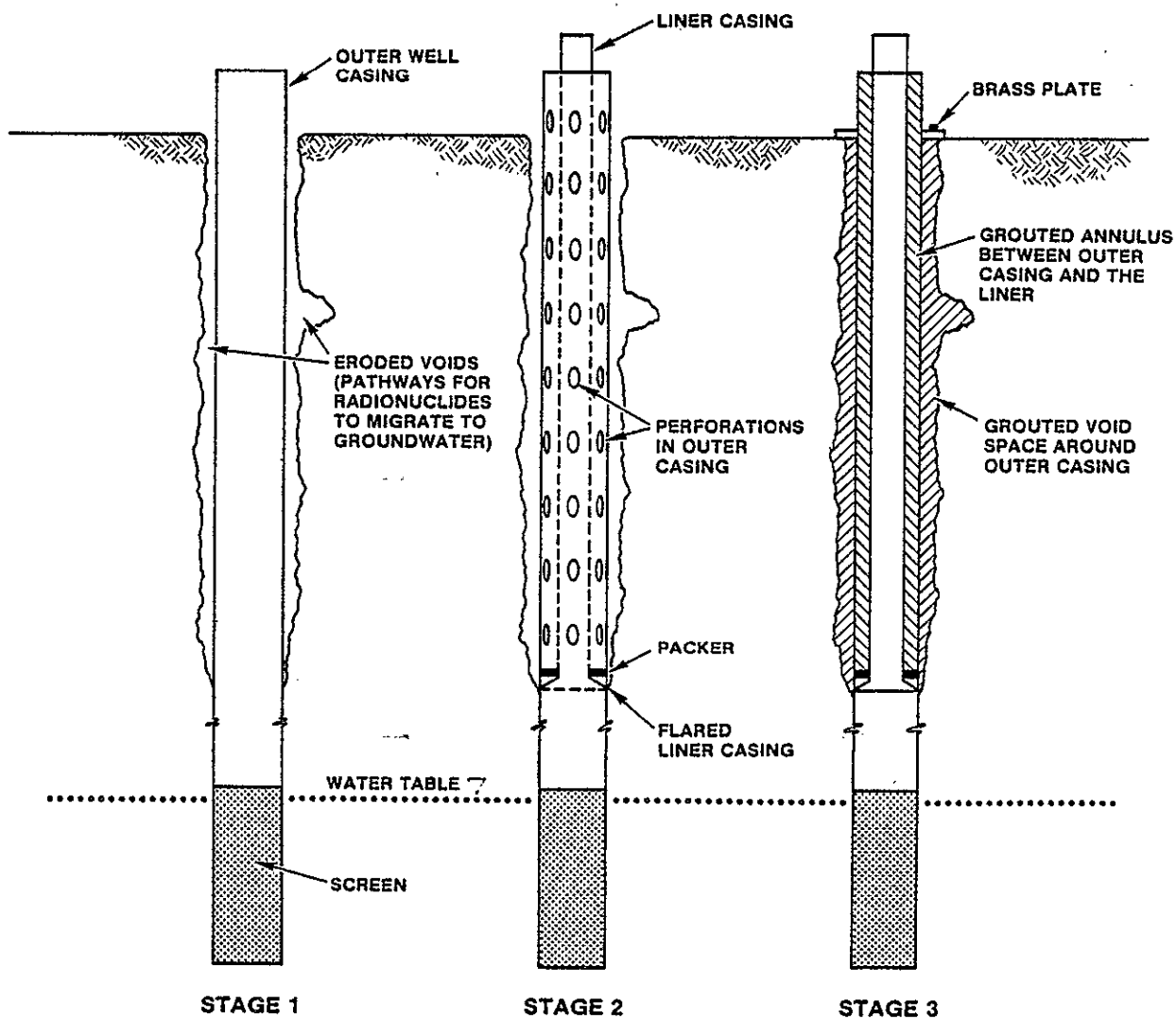
^aExisting wells added.

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^bNewly constructed wells.

^cThe new 216-U-17 Crib was not activated in 1987.

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Figure 3. Idealized Cross-Sectional Views Depicting Well Construction ("Old" Method).

the protection of an adequate seal at the surface and between the casing and sediments, voids around the well casing can provide a possible pathway for surface or subsurface contamination to reach the ground water. Renovation is accomplished by applying stages 2 and 3 of the "old" method of well construction to the unsealed well. Four wells were renovated in CY 1987 (Table 2).

Table 2. List of Wells Renovated in CY 1987.

299-W15-06	299-W15-09
299-W15-08	299-W22-10

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The "new" method of well construction emplaces a permanent stainless-steel casing after pulling back two temporary construction casings of carbon steel (Figure 4). Three stages are also used in this technique. In stage 1, two casings are emplaced: a starter casing of carbon steel to a depth of 100 ft (30.5 m), with a carbon-steel well casing of smaller diameter placed inside and extending to the desired depth. Stage 2 involves placement of a third casing of stainless steel with a screen at the bottom inside the outer two casings. This is the only casing that is left in place. The carbon-steel well casing that was placed to the desired depth is then pulled back in stage 3, while placing a sand pack to a depth of 10 ft (3.0 m) above the top of the well screen and then bentonite grout up to a depth of 20 ft (6.1 m) below ground surface. The starter casing is also pulled back to the 20-ft (6.1-m) depth while placing bentonite. Cement grout is then placed on top of the bentonite in the upper 20 ft (6.1 m) of the well. The six wells constructed in 1987 (see Table 1) are constructed in this manner.

For both construction methods, the wells are fitted with a cement collar at the ground surface. A brass plate bearing the well number is embedded in the collar to prevent misidentification.

2.2 SAMPLING

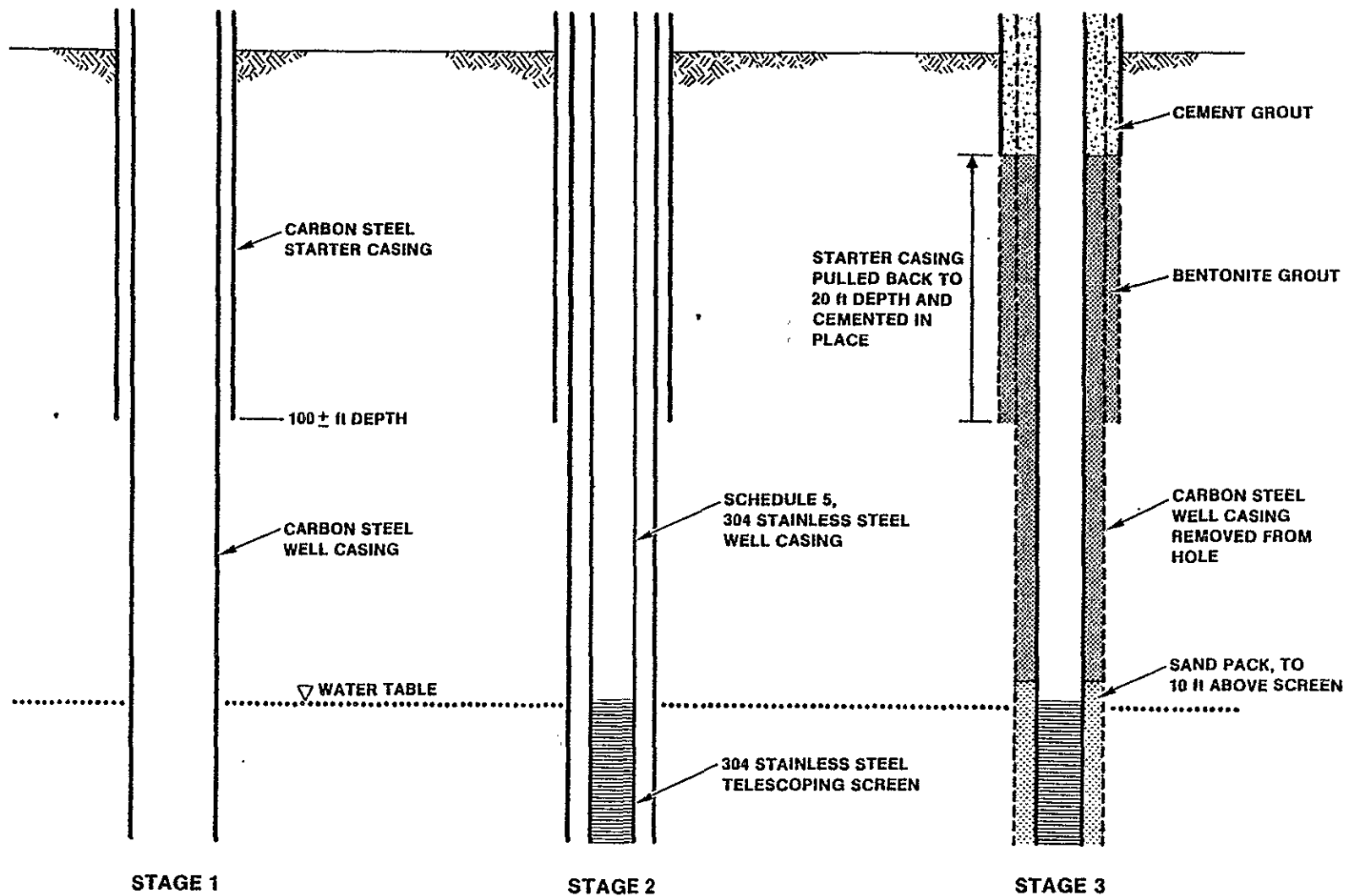
The following criteria are used to determine sampling frequencies for routinely monitored wells:

- Wells monitoring active liquid waste disposal sites are sampled monthly.
- Wells monitoring inactive liquid waste disposal sites that contain radionuclides with a high potential for being remobilized are sampled monthly.
- Wells monitoring inactive liquid waste disposal sites that contain radionuclides with a low potential for being remobilized are sampled monthly or quarterly, depending upon the level and trend of concentration.
- Wells yielding samples indicating background concentrations are sampled semiannually.

To supplement routine sampling, nonroutine samples are often requested at wells to confirm increasing trends or unusual patterns observed during routine monitoring. Nonroutine sampling may include special sampling of wells not on the sampling schedule and the addition of new constituents to the analysis of scheduled samples.

Monitoring wells with dedicated sampling pumps are pumped to remove stagnant water from the well before a sample is collected (Figure 5). Wells that do not contain a pump are sampled by bailing. Samples are collected from the screened or perforated section of the well in the uppermost 20 to 40 ft (6 to 12 m) of the aquifer, where the highest levels of contamination are typically found.

The ground-water sampling data presented in this report were collected according to the schedule listed in Appendix C of last years report (Law et al. 1987). Sampling during CY 1988 will proceed according to the schedule listed in Appendix C of this report.



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Figure 4. Idealized Cross-Sectional Views Depicting Well Construction ("New" Method).

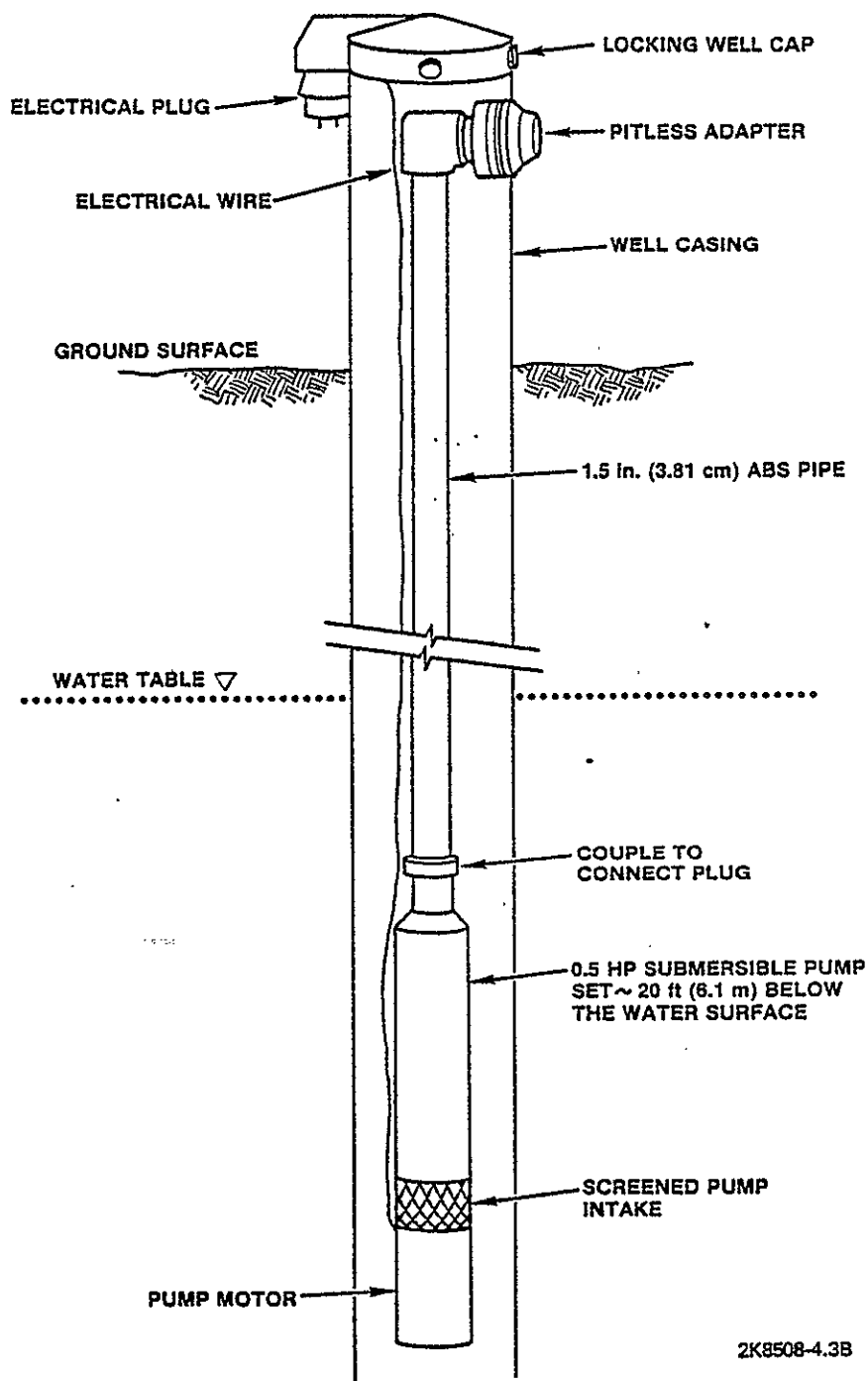


Figure 5. Cross-Sectional View of a Ground-Water Monitoring Well with Pump.

2.3 ANALYSES

Under the routine monitoring program samples are analyzed selectively for the following constituents: total alpha, total beta, tritium, total uranium, ^{90}Sr , ^{137}Cs , ^{60}Co , ^{106}Ru , and nitrate. Results of these analyses are summarized in Tables B-1 and B-2 of Appendix B. Routine analyses for isotopic uranium (^{234}U , ^{235}U and ^{238}U) and isotopic plutonium (^{238}Pu and $^{239,240}\text{Pu}$) are also performed, primarily for establishing a baseline. These results are listed in Table B-3 of Appendix B. The constituent analyses conducted for each well are listed in Appendix C. Selection of these parameters is based on the waste disposal history of each site. The analyses are performed by U.S. Testing in accordance with their procedures. In addition to the routine program, special analyses are conducted for ^{129}I and ^{99}Tc . A discussion of these results is provided in Section 7.0 of this report.

2.4 WATER-LEVEL MEASUREMENTS

Water-level measurements of the unconfined aquifer are made in 200 wells to produce a contoured water-table map of the Separations Area (Figure 2). Depth to water in wells completed in the Rattlesnake Ridge confined aquifer are also measured to construct a map comparing the potentiometric surfaces of the uppermost confined and unconfined aquifers (Figure 27). The Hanford Site water table map (Plate 1) supplements the Separations Area map with measurements from 111 additional wells throughout the site.

2.5 DATA STORAGE AND INTERPRETATION

Data are received electronically from the laboratory and also in the form of a computer printout. The data are reviewed in the context of the concentration history of the well to establish the validity and are also examined for trends that may suggest modification of the sampling frequency or require other action. Repeat analyses may be performed on data that are not consistent with previous trends. Rerun values

that are confirmed to be fliers by subsequent data may be eliminated from the calculations used to create Tables B-1 and B-2 in Appendix B. These fliers are listed in Table B-4 for completeness. All ground-water analysis results generated on the Site are stored in the PNL Hanford Ground-Water Data Base. Westinghouse Hanford maintains a subset of the PNL data base in a PARADOX[®] data base for analyzing and reporting Separations Area data.

Radionuclide concentrations in the ground water are compared with administrative control limits (ACL) established by Westinghouse Hanford as guidance for operational purposes (Part L of RHO-MA-139, *Environmental Protection Manual*). These ACL, listed in Table 3, apply to the level of contamination in the ground water beneath a waste site. The ACL are based on meeting drinking water standards at the end of institutional control (assumed to be in the year 2150 AD), which is in accordance with Westinghouse Hanford's philosophy to reduce contaminant levels in the environment to as-low-as-reasonably-achievable (ALARA). Because differences in travel times to the Columbia River between 200 East Area and 200 West Area affect the amount of radioactive decay that can occur during transit, two ACL were created for each constituent. The ACL for 200 West Area are higher than those for 200 East Area because the travel time to the Columbia River is longer, allowing a greater reduction in contamination by radioactive decay. In computing the ACL, no allowance is made for dispersion or dilution, which would reduce concentrations further.

The radionuclide concentrations in the ground water are also compared with the derived concentration guides (DCG) as directed by DOE. The DCG, listed in Table 3, were developed to establish the maximum allowable radiation exposure to the public at 100 mrem/yr for occasional exposure expected to last longer than 5 yr. Note that the DCG are applicable at the point of actual exposure to members of the public; therefore, they are not applicable to the Hanford Site proper. For reference, observations are made in this report relating how the concentration of a radionuclide in ground water at a waste site compares with the DCG.

Table 3. Radionuclide Concentration Guidelines.

Radionuclide	Derived concentration guides (DCG) ^a (pCi/L)	200 Area East (E) or West (W)	RHO-MA-139 administrative control limit (ACL) ^b (pCi/L)	Previously used ACL ^c (pCi/L)
Tritium (³ H)	2.0 E+06	E W	(d) (d)	-- --
⁶⁰ Co	5.0 E+03	E W	5.0 E+03 5.0 E+03	(3.0 E+04)
⁹⁰ Sr	1.0 E+03	E W	7.4 E+01 4.8 E+02	(3.0 E+01)
⁹⁹ Tc	1.0 E+05	E W	4.0 E+03 4.0 E+03	(2.0 E+05)
¹⁰⁶ Ru	6.0 E+03	E W	6.0 E+03 6.0 E+03	(1.0 E+04)
¹²⁹ I	5.0 E+02	E W	2.0 E+01 2.0 E+01	(6.0 E+01)
¹³⁷ Cs	3.0 E+03	E W	2.1 E+02 1.2 E+03	(2.0 E+03)
²³⁴ U	5.0 E+02 ^e	E W	2.0 E+01 ^f 2.0 E+01	(3.2 E+01)
²³⁵ U	6.0 E+02	E W	2.4 E+01 2.4 E+01	(3.2 E+01)
²³⁸ U	6.0 E+02	E W	2.4 E+01 2.4 E+01	(4.8 E+00)
²³⁸ Pu	4.0 E+03	E W	2.0 E+02 3.6 E+02	(4.4 E+02)
^{239,240} Pu	3.0 E+03	E W	1.2 E+02 1.2 E+02	(4.0 E+01)

^aRHO-MA-139, Appendix A (Rockwell 1987).^bRHO-MA-139, L.30 C (Rockwell 1987).^cRHO-MA-139, 1985 version.^dNo ACL for tritium. Annual tritium discharge to ground water from Westinghouse Hanford facilities shall not exceed 2.0 E+04 Ci/yr (Rockwell 1987).^eFor the isotopic composition of uranium in ground water in the Separations Area, the equivalent concentration of total uranium is 1.0 E+03 pCi/L.^fFor the isotopic composition of uranium in ground water in the Separations Area, the equivalent concentration of total uranium is 4.0 E+01 pCi/L.

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Therefore, this comparison is conservative as it neglects the time for ground water to reach the point of exposure to the public, with attendant sorption, dispersion, dilution, and radioactive decay.

If the concentration of a radionuclide in the ground water at a disposal facility is found to exceed the ACL, an investigation is initiated to determine the cause. If an active disposal facility is found to be the cause of exceeding the ACL, the facility is either removed from service or a deviation is written specifying the conditions under which the facility may continue to operate under management control. The need for remedial action is also evaluated.

When little or no measurable radioactivity is evident, the background activity of the counting instrument may be greater than the activity of the sample, resulting in negative analytical values. Following DOE guidance (ERDA 1977), these negative numbers are maintained in the computation of average concentrations.

Uranium is measured chemically in the laboratory and reported as total uranium representing the sum of ^{234}U , ^{235}U , and ^{238}U . Laboratory results for total uranium are reported in chemical units of micrograms per liter, and are converted to the radioactivity units of pico curies per liter using a conversion factor derived from a series of isotopic uranium analyses of ground-water samples. The computed conversion factor is 0.679 pCi/ μg . Based on the relative abundances and activities

of the three uranium isotopes that comprise total uranium, the DCG and ACL for ^{234}U are the most restrictive. Therefore, total uranium concentrations are compared to the equivalent derived ^{234}U concentration. The derived ACL for total uranium is 40 pCi/L, which is calculated from the ^{234}U ACL of 20 pCi/L. The derived DCG for total uranium is 1,000 pCi/L.

Nitrate is mobile in ground water; therefore, nitrate concentrations are determined and the results are used to prepare maps for evaluating the extent of ground-water contamination. The maps show the EPA drinking water standard (EPA 1976) of 45 parts per million (ppm), reported as nitrate, for reference purposes only. These drinking water standards are not currently applicable to the Hanford Site (until 2150 AD) because the ground water is not a public drinking water supply.

2.6 QUALITY ASSURANCE

Quality assurance is included in all aspects of the monitoring program: well maintenance; sampling; analytical procedures; and data interpretation, storage, and reporting. A quality control plan is in place and is being administered. The monitoring program is subject to external audits by Quality Assurance (QA) and to internal audits by the Environmental Technology Section.

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3.0 ACTIVE DISPOSAL SITES

This section reports the results of the ground-water monitoring program at active liquid waste disposal sites in CY 1987.

Low-level radioactive liquid wastes generated in the processing facilities in the 200 Areas are discharged to the soil column for disposal. Potentially contaminated cooling water is disposed of to surface ditches and ponds. Other liquid wastes containing low-level radioactive constituents are disposed of to subsurface facilities designated as cribs. Ground-water monitoring near surface ponds is discussed in Section 3.1; monitoring near subsurface facilities is discussed in Section 3.2.

In the following discussions of the pond and crib sites, the average, maximum, and minimum concentrations of constituents are tabulated for each ground-water monitoring well. The average concentrations are then compared with the ACL and DCG (see Table 3). The comparison with the DCG is very conservative because the DCG is applicable at the point of actual exposure to the public. The concentration of a radionuclide during transport from a site to the river will be attenuated by dispersion, dilution, sorption, and radioactive decay (see Section 1.3.4) and would be further attenuated by dilution and dispersion in the Columbia River. Nitrate results are reported in terms of nitrate, rather than nitrogen. For comparison, the drinking water standard for nitrate is 45 ppm when reported as nitrate versus 10 ppm when reported as nitrogen. The 1987 results are also compared with 1986 results (Law et al. 1987).

Because there is no established ACL for tritium in the ground water, release of tritium in liquid waste streams is limited by RHO-MA-139 to $2.0 \text{ E} + 04 \text{ Ci/yr}$ (Table 3). During 1987, a total of $2.01 \text{ E} + 03 \text{ Ci}$ of tritium were released from Separations Area facilities. Tritium in the ground water is compared against the DCG in this report, though the DCG is only applicable at the point of actual exposure to the public.

3.1 SURFACE LIQUID DISPOSAL SITES

Four major surface liquid disposal sites were in operation during 1987 for the disposal of waste water, primarily cooling water: 216-A-25 (Gable Mountain Pond), 216-B-3 (B-Pond), 216-B-63 Ditch in 200 East Area, and the 216-U-14 Ditch in 200 West Area. Decommissioning of Gable Mountain Pond was completed in late 1987, and the facility is no longer in service. The locations of the two ponds are shown in Figure 2.

In 1987, a total of $5.94 \text{ E} + 09 \text{ gal}$ ($2.25 \text{ E} + 10 \text{ L}$) of liquid effluent was discharged from the 200 Area to B-Pond, Gable Mountain Pond, and the 216-B-63 Ditch by the following effluent streams:

- PUREX cooling water (CWL)
- B Plant cooling water (CBC)
- 242-A evaporator cooling water (ACW)
- 242-A evaporator steam condensate (ASC)
- 244-AR Vault cooling water (CAR)
- 241-A Tank Farm cooling water (CA8)
- PUREX chemical sewer (CSL)
- B Plant chemical sewer (BCE).

These streams are routed to either Gable Mountain Pond (prior to deactivation) or the B-Pond system, with the exception of the CSL effluent steam, which goes directly to B-Pond, and the BCE stream, which is discharged to the 216-B-63 Ditch.

In the 200 West Area, the only major surface liquid disposal facility is the 216-U-14 Ditch.

Several minor surface liquid waste disposal facilities that receive low volumes of effluent are not discussed: the 216-S-10 Ditch for the Redox air conditioning water; the 216-T-1 Ditch, which

receives waste from the T Plant drain flush and headend wastes; the 216-T-4-2 Ditch and 216-T-4 Pond, which receive chemical drain compressor wastes from the 221-T and 224-T Buildings; the 216-Z-21 Basin, which receives noncontaminated air conditioning condensate from the Plutonium Finishing Plant (PFP); and the powerhouse ponds in 200 East and 200 West Areas.

3.1.1 216-A-25 (Gable Mountain) Pond

Gable Mountain Pond and the associated overflow pond were deactivated when backfilling was completed in the fall of 1987. Final stabilization of the site, located north of 200 East Area and south of Gable Mountain (see Figure 2), will be completed in 1989. Prior to deactivation, the pond received $2.47 \text{ E} + 08$ gal ($9.35 \text{ E} + 08$ L) of liquid waste during 1987, about 30% less than in 1986.

Present ground-water monitoring activities center on tracking an accidental ^{90}Sr spill that was released to the pond in 1964 when a cooling coil broke in PUREX and that showed up in the ground water in 1984. Increases in ^{90}Sr concentration in well 699-53-47A prompted an investigation in 1984 (Law et al. 1986). Five new wells were drilled and several existing wells were added to the monitoring network to determine the extent of the plume. Distribution coefficients calculated for ^{90}Sr in the soil samples from the new wells were relatively high. The investigation concluded that the plume was localized and transport of contamination to the Columbia River was so slow as to have no significant environmental impact at the Hanford Site boundary.

Twelve wells in the Gable Mountain Pond vicinity continue to be monitored (see Figure A-5). Concentrations of radioactive constituents in the six near-field downgradient wells and the six far-field downgradient wells are summarized in Table 4. The average concentration of ^{90}Sr exceeds the ACL, but not the DCG, in two wells, 699-53-47B and 699-53-48B. No other ACL or DCG are exceeded. Trends in the near-field wells indicate that while 699-53-47B is showing very little

change in ^{90}Sr concentration (Figure 6), wells 699-54-48 (Figure 7) and 699-54-49 (Figure 8), which are further downgradient, have increasing concentrations suggesting a northwesterly movement of the plume. However, the reduction of discharge to Gable Mountain Pond, which may have been diluting the ^{90}Sr contamination, could be responsible for these increases as well as the upturn observed in well 699-53-48B (Figure 9). Decline of the small water-table mound beneath the pond may also affect ^{90}Sr concentrations in near-field wells as the ground-water flow paths adjust.

3.1.2 216-B-3 (B-Pond) System

The B-Pond system is composed of the 34-acre (14-ha) main pond, 216-B-3; two 11-acre (4-ha) expansion ponds, 216-B-3A and 216-B-3B; and a third expansion pond of 41 acres (17 ha), 216-B-3C. A contingency pond was constructed north of the main pond in 1987 for use in case of an emergency. The total capacity was not completely used in 1987 with the B-Pond system receiving an estimated $5.86 \text{ E} + 09$ gal ($2.22 \text{ E} + 10$ L) of effluent.

The pond system is monitored by wells 699-42-40A and 699-42-40B (see Figure 2 and Figure A-11). Concentrations of radionuclides, listed in Table 5, are below the DCG and ACL and are similar to 1986 results. The contingency pond, which was not used in 1987, is monitored by well 699-45-42. Baseline data collected from this well during the last four months of 1987 are also summarized in Table 5.

3.1.3 216-B-63 Ditch

The 216-B-63 ditch, located in north-central 200 East Area (see Figure 10), receives the B Plant Chemical Sewer (BCE) stream. The 1,400-ft (430-m) long ditch was activated in 1970 and received $9.26 \text{ E} + 07$ gal ($3.51 \text{ E} + 08$ L) of liquid waste in 1987.

Well 299-E34-01 is currently being used to monitor the ditch because it is the closest available well (see Figure A-15). However, it is located 500 ft (150 m) away from, and possibly

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Table 4. Concentrations of Radiological Constituents and Nitrate in Ground Water Near the 216-A-25 (Gable Mountain)
Pond in 1987. (sheet 1 of 2)

Well no.		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (ug/L)	Nitrate (PPB)
Near-Field Downgradient Wells										
699-53-47A	MAX ^a	6.20E+00	1.43E+02	NN ^d	5.61E+00	7.99E+01	3.39E+01	4.66E+00	NN	NN
	AVG ^b	2.50E+00	1.11E+02		-4.15E+00	6.15E+01	6.26E+00	-3.00E-01		
	MIN ^c	1.00E-01	8.68E+01		-1.72E+01	4.27E+01	-3.08E+01	-1.12E+01		
699-53-47B	MAX	5.40E+00	1.90E+02	NN	6.41E+00	1.15E+02	5.48E+01	2.75E+00	NN	NN
	AVG	3.70E+00	1.57E+02		3.50E-01	8.52E+01	-8.50E-01	-1.80E-01		
	MIN	2.90E+00	1.35E+02		-7.89E+00	7.03E+01	-4.32E+01	-4.16E+00		
699-53-48A	MAX	1.88E+01	1.62E+01	NN	7.00E+00	1.62E+00	7.85E+01	3.20E+00	NN	NN
	AVG	4.60E+00	9.70E+00		-6.10E-01	8.00E-01	1.47E+01	-1.10E+00		
	MIN	9.00E-01	5.90E+00		-1.01E+01	-1.00E-02	-1.76E+01	-4.16E+00		
699-53-48B	MAX	2.20E+00	6.91E+02	NN	9.73E+00	4.39E+02	4.42E+01	1.13E+01	NN	NN
	AVG	4.00E-01	5.45E+02		3.36E+00	3.14E+02	-2.41E+01	2.50E+00		
	MIN	-2.00E-01	3.65E+02		-4.91E+00	2.01E+02	-7.36E+01	-3.85E+00		
699-53-55A	MAX	1.80E+00	9.60E+00	NN	5.36E+00	2.70E-01	3.66E+00	7.70E+00	NN	NN
	AVG	1.10E+00	8.00E+00		4.35E+00	8.00E-02	-3.65E+01	5.54E+00		
	MIN	3.00E-01	6.30E+00		2.81E+00	-2.00E-01	-9.90E+01	4.00E+00		
699-54-48	MAX	2.20E+00	1.17E+02	NN	6.39E+00	5.90E+01	6.46E+01	7.18E+00	NN	NN
	AVG	1.50E+00	1.05E+02		1.95E+00	5.05E+01	1.64E+00	-4.00E-01		
	MIN	9.00E-01	8.95E+01		-1.70E+00	3.79E+01	-5.64E+01	-9.24E+00		
699-54-49	MAX	1.80E+00	1.23E+02	NN	NN	5.81E+01	NN	NN	NN	NN
	AVG	1.10E+00	6.93E+01			3.26E+01				
	MIN	8.00E-01	2.24E+01			1.20E+01				

9 2 1 2 5 0 0 0 7 3 9

Table 4. Concentrations of Radiological Constituents and Nitrate in Ground Water Near the 216-A-25 (Gable Mountain) Pond in 1987. (sheet 2 of 2)

Well no.		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (ug/L)	Nitrate (PPB)
Far-Field Downgradient Wells										
699-55-50C	MAX	8.00E-01	5.60E+00			7.60E-01				
	AVG	7.00E-01	4.80E+00	NN	NN	5.00E-01	NN	NN	NN	NN
	MIN	4.00E-01	3.70E+00			-8.00E-02				
699-55-50D	MAX	1.90E+00	4.56E+01			9.10E-01				
	AVG	9.00E-01	2.48E+01	NN	NN	3.30E-01	NN	NN	NN	NN
	MIN	-1.00E-01	4.80E+00			-1.80E-01				
699-56-51	MAX	4.00E-01	5.10E+00							
	AVG	4.00E-01	5.10E+00	NN	NN	NN	NN	NN	NN	NN
	MIN	4.00E-01	5.10E+00							
699-59-58	MAX	1.20E+00	5.00E+00			-3.00E-01				
	AVG	1.20E+00	4.80E+00	NN	NN	-3.70E-01	NN	NN	NN	NN
	MIN	1.20E+00	4.50E+00			-4.40E-01				
699-63-58	MAX	9.00E-01	1.78E+01			8.00E-02				
	AVG	8.00E-01	1.61E+01	NN	NN	-3.00E-02	NN	NN	NN	NN
	MIN	7.00E-01	1.43E+01			-1.50E-01				

a Maximum.

b Average.

c Minimum.

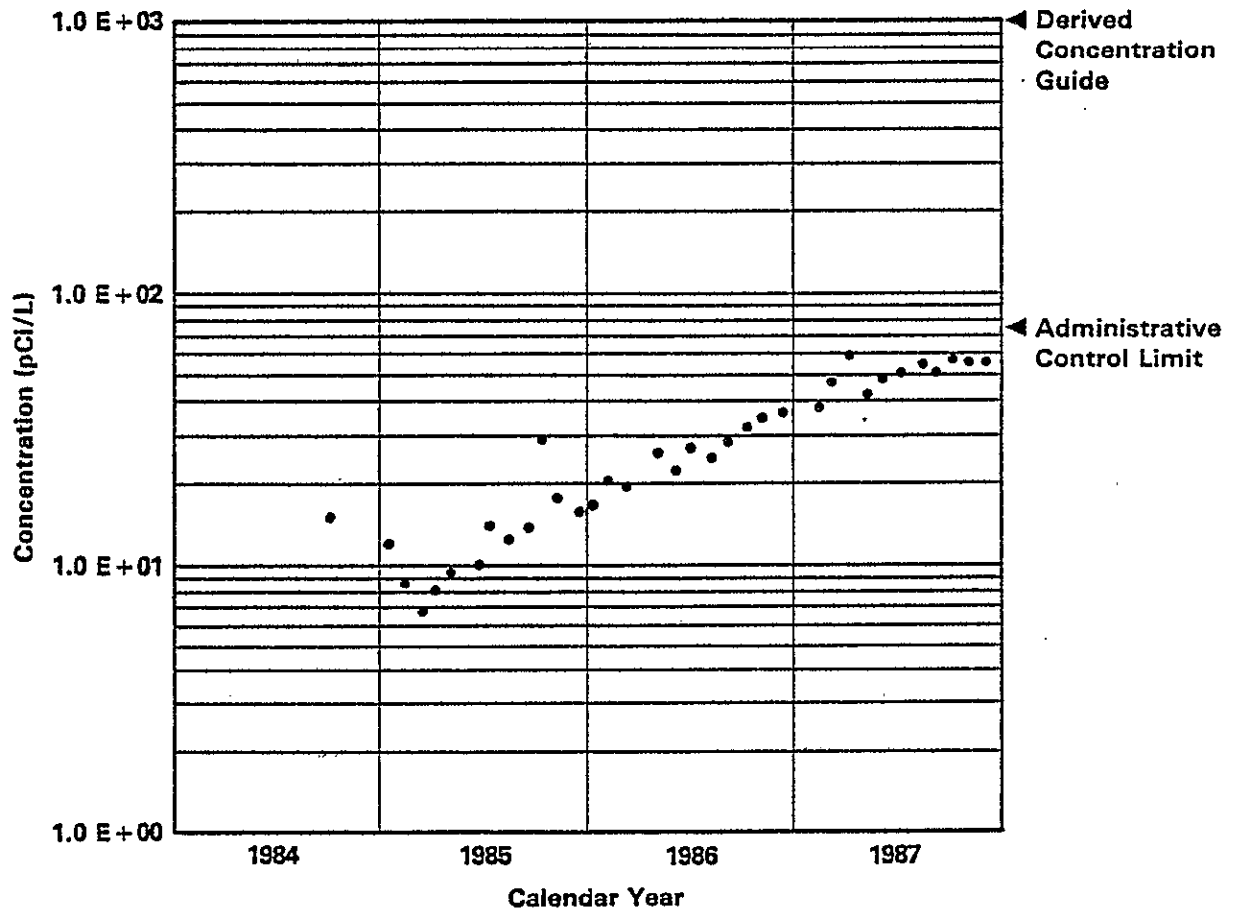
d Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).

3-4

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3-5

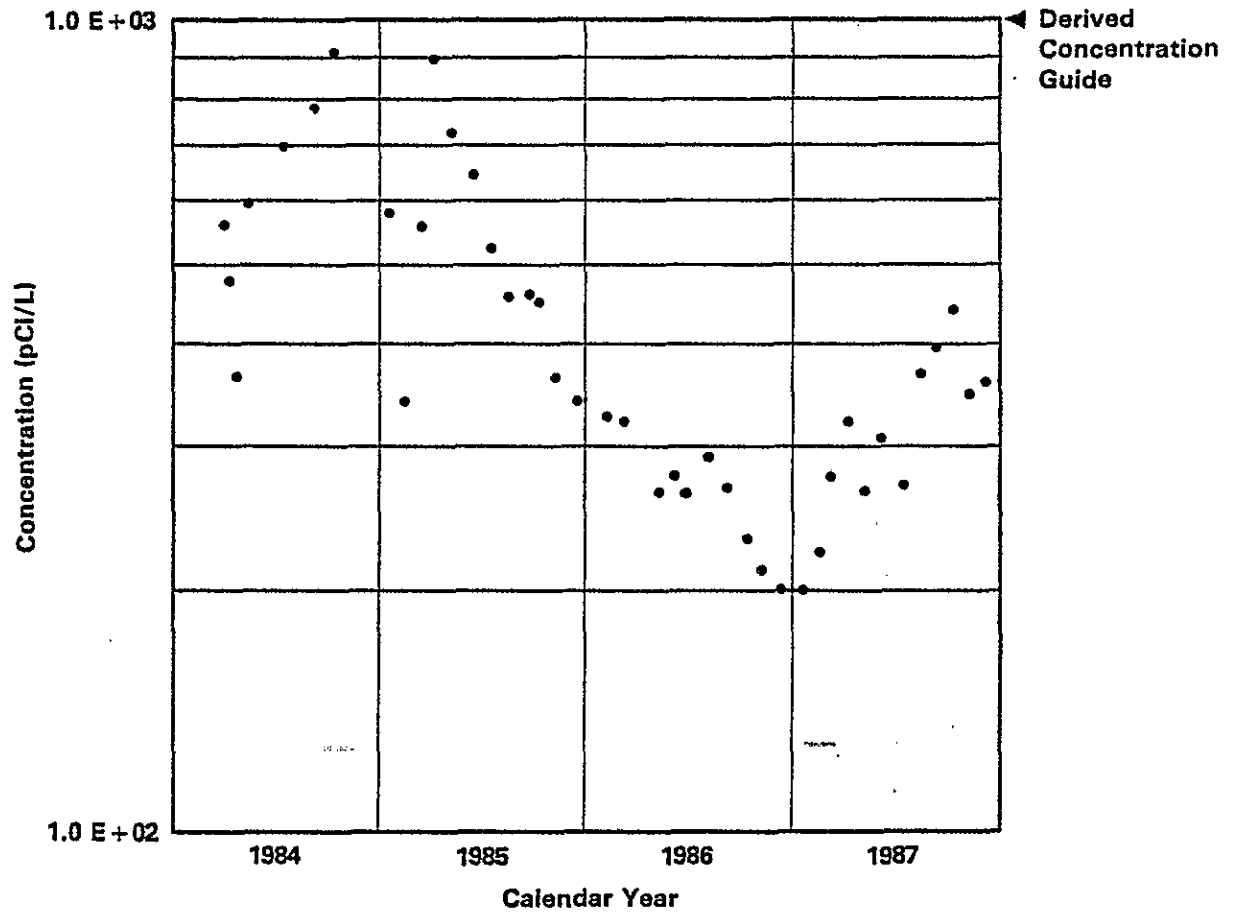


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Figure 7. Strontium-90 Concentration History for Well 699-54-48 at the 216-A-25 Pond.



3-7



28903-025.4

Figure 9. Strontium 90 Concentration History for Well 699-53-48B at the 216-A-25 Pond.

Table 5. Concentrations of Radiological Constituents and Nitrate for the Effluent and for Ground Water Near the 216-B-3 (B Pond) System in 1987.

		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
Effluent										
PUREX/B Plant (see Table 23 for streams)	AVG ^a	<3.31E+00	<2.64E+01	1.29E+04	NA ^b	<1.77E+01	NN	<4.12E+01	NN ^c	7.10E-01
Well										
699-42-40A	MAX ^d	1.70E+00	5.10E+00	7.00E+02	7.49E+00	8.30E-01	6.33E+01	7.14E+00	1.00E+00	2.31E+04
	AVG	7.00E-01	4.10E+00	3.19E+02	2.37E+00	2.10E-01	3.04E+00	2.52E+00	7.00E-01	9.37E+03
	MIN ^e	0.00E+00	3.30E+00	3.40E+00	-7.91E+00	-2.60E-01	-6.34E+01	-4.53E+00	4.00E-01	2.50E+03
699-42-40B	MAX		6.90E+00	2.77E+03	6.27E+00	4.40E-01	6.83E+01	7.33E+00		2.50E+03
	AVG	NN	4.00E+00	5.25E+02	1.82E+00	1.60E-01	1.19E+01	-4.00E-01	NN	1.51E+03
	MIN		2.10E+00	-9.52E+01	-9.73E+00	-3.00E-02	-3.97E+01	-4.79E+00		5.00E+02
699-45-42	MAX	2.10E+00	4.80E+00	5.29E+04	4.05E+00	2.20E-01	6.29E+01	7.28E+00	2.50E+00	
	AVG	1.80E+00	3.90E+00	5.20E+04	-4.59E+00	6.00E-02	-8.54E+00	1.30E-01	2.20E+00	NN
	MIN	1.70E+00	3.00E+00	5.11E+04	-2.03E+01	-2.70E-01	-7.23E+01	-9.83E+00	1.90E+00	

^a Average.

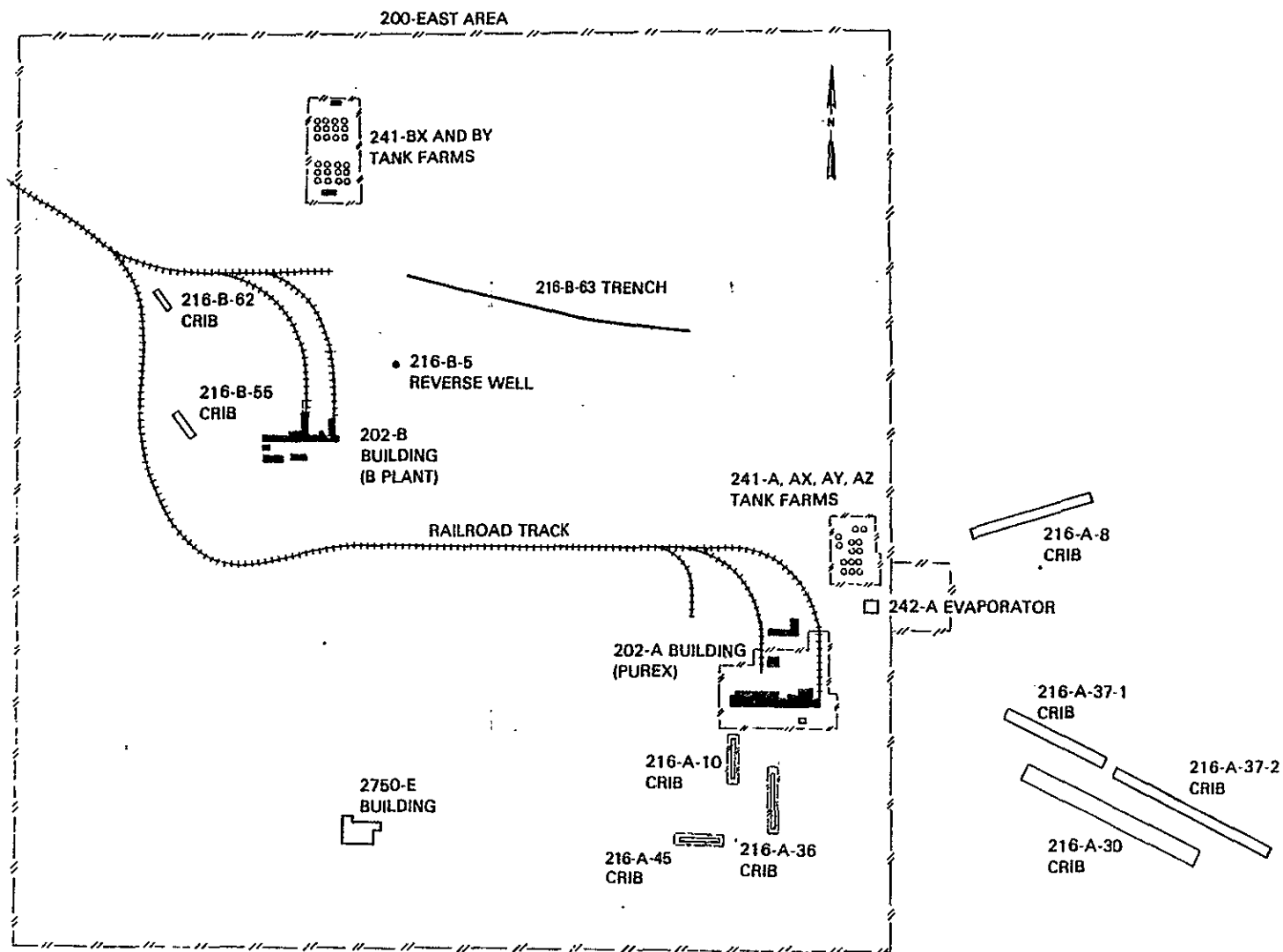
^b Not available.

^c Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).

^d Maximum.

^e Minimum.

9 2 1 2 5 0 0 7 9 5



2K8406-6.20A

Figure 10. Location Map for Selected Liquid Waste Disposal Sites in 200 East Area:

WHC-EP-0152

upgradient of the ditch; therefore, it may not be providing adequate monitoring. Table 8 lists the average concentration of radionuclides in well 299-E34-01, which are all below the DCG and ACL and are similar to values observed in the past.

3.1.4 216-U-14 Ditch

The portion of the old 216-U-14 Ditch between the 207-U retention basin and the 242-S Evaporator was activated in March 1985 to receive steam condensate waste, chemical sewer waste, cooling water from the 224-U and 271-U Plants, and nonprocess effluent from the 242-S Evaporator. The ditch is located west of 271-U Plant and north of the 242-S Evaporator in the 200 West Area (Figure 11). The volume of the effluent stream totaled $9.42 \text{ E} + 07$ gal ($3.5 \text{ E} + 08 \text{ L}$) in 1987.

Wells 299-W19-21 and 299-W19-27 (see Figure A-22) were constructed in 1986 and 1987, respectively, to monitor the ditch. Data relating to these wells are listed in Table 7. Concentrations of all radionuclides were below the DCG and ACL, though uranium was detected in both wells. An investigation was conducted to determine if disposal of uranium bearing effluent to the ditch is contributing to the elevated values in the ground water. The study indicated that most of the disposed uranium is retained near the bottom of the ditch and that effluent percolating to the aquifer has a lower uranium concentration than the aquifer water. This evidence suggests that uranium contamination beneath the ditch originates from another source, possibly the decommissioned 216-U-10 Pond.

3.2 SUBSURFACE LIQUID DISPOSAL SITES

Low-level radioactive liquid wastes from processing operations are disposed of to subsurface cribs. A typical crib (Figure 12) consists of a long, trapezoidal, rock-filled trench covered with a sheet of plastic and several feet of backfill. A perforated distributor pipe disperses the waste throughout the length of the crib.

Vents allow gases to escape, and liquid-level gauges are emplaced to evaluate the ability of the crib to drain to the soil.

There were 14 cribs classified as active during 1987, as indicated in Table 8. Four of these cribs, 216-A-8, 216-B-55, 216-B-62, and 216-S-25, did not receive any waste in 1987 but are still considered active. Two other cribs, 216-A-10 and 216-A-36B, were removed from service in January and August 1987, respectively, but are also considered active for this report. Ground-water samples were collected from monitoring wells near these active crib sites (crib locations are shown in Figures 10 and 11; the location of monitoring wells at crib sites is shown in a series of maps in Appendix A).

To provide a perspective on crib performance, the concentrations of radionuclides in the effluent streams are included in the table for each site.

Graphs depicting long-term concentration histories of selected constituents in the effluent stream and monitoring wells are presented in Appendix D for cribs receiving waste water from the 202-A Building (PUREX) and associated facilities and the 221-B Building (B Plant). Effluent concentrations are shown on the concentration history graphs only for years that disposal occurred. Ground-water data points are shown for all years that data are available. Consecutive years are connected by a solid line; a dashed line is drawn between data points when no data are provided for the intervening years.

3.2.1 216-A-8 Crib

The 216-A-8 Crib receives condensate waste (A8) from the 241-A, AY, and AZ Tank Farms. The crib is located east of the 241-AX Tank Farm outside the 200 East Area perimeter fence (see Figure 10). The crib was in operation during 1955 to 1958, 1966 to 1976, 1978, and 1983 through 1985. No effluent was discharged to this crib in 1986 or 1987 due to problems with the inline sampler, which will be fixed this year.

9 2 1 2 5 0 0 0 7 9 7

Table 6. Concentrations of Radiological Constituents and Nitrate for the Effluent and for Ground Water Near the 216-B-63 Ditch in 1987.

		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
Effluent										
B Plant (BCE)	AVG ^a	<9.75E+00	<6.16E+01	NN ^b	NAC ^c	<6.55E+01	NN	<1.07E+02	NN	
Well										
299-E34-01	MAX ^d	2.90E+00	1.21E+01	1.34E+03	6.83E+00		7.21E+01	9.96E+00		
	AVG	2.30E+00	9.50E+00	7.84E+02	1.80E+00	NN	2.56E+00	3.90E-01	NN	NN
	MIN ^e	1.40E+00	7.60E+00	2.54E+02	-1.08E+01		-5.78E+01	-6.04E+00		

^a Average.

^b Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).

^c Not available.

^d Maximum.

^e Minimum.

9212500798

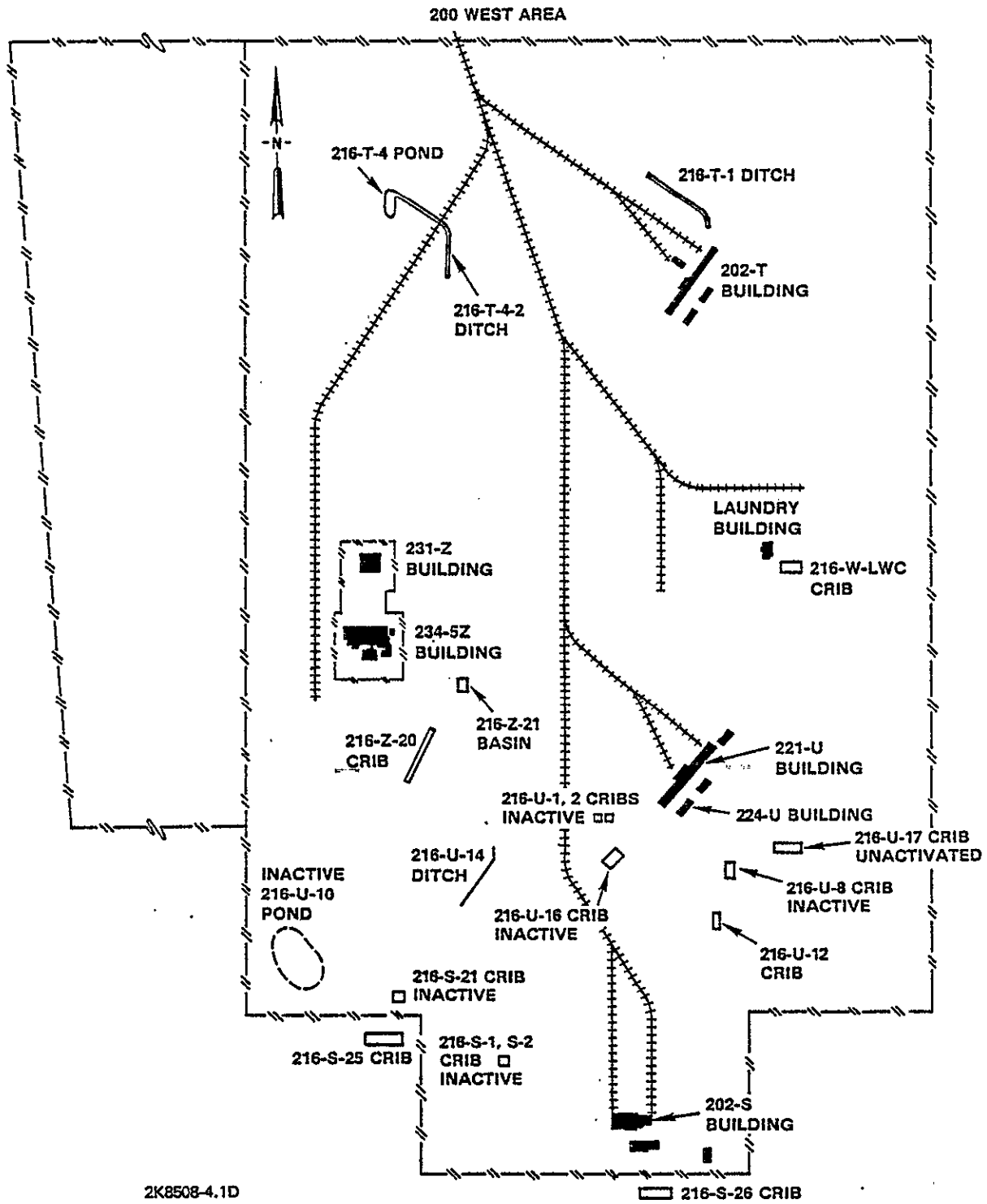


Figure 11. Location Map for Selected Liquid Waste Disposal Sites in 200 West Area.

9 2 1 2 5 0 0 0 7 9 9

Table 7. Concentrations of Radiological Constituents and Nitrate for the Effluent and for Ground Water Near the 216-U-14 Ditch in 1987.

		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (ug/L)	Nitrate (PPB)
Effluent										
UO ₂ Plant	AVG ^a	<8.77E+00	<7.12E+01	NN ^b	NA ^c	<1.09E+00	NN	<3.52E+00	6.64E+00	6.00E-01
Well										
299-W19-21	MAX ^d	1.99E+01	1.69E+01	3.09E+02	5.63E+00	4.70E-01	7.28E+01	6.89E+00	2.69E+01	3.02E+03
	AVG	1.70E+01	1.15E+01	1.21E+02	1.09E+00	3.10E-01	2.62E+01	2.08E+00	2.22E+01	2.40E+03
	MIN ^e	1.18E+01	7.70E+00	-9.66E+01	-4.81E+00	2.00E-02	-2.82E+00	-2.33E+00	1.21E+01	1.26E+03
299-W19-27	MAX	1.04E+01	1.92E+01	2.41E+02	5.35E+00	4.70E-01	5.36E+01	4.70E+00	1.30E+01	3.86E+03
	AVG	9.10E+00	1.57E+01	1.23E+02	2.13E+00	0.00E+00	-4.76E+01	-1.33E+00	1.20E+01	3.17E+03
	MIN	8.50E+00	1.16E+01	1.51E+01	-8.16E+00	-2.90E-01	-2.00E+02	-1.40E+01	1.09E+01	2.50E+03

^a Average.

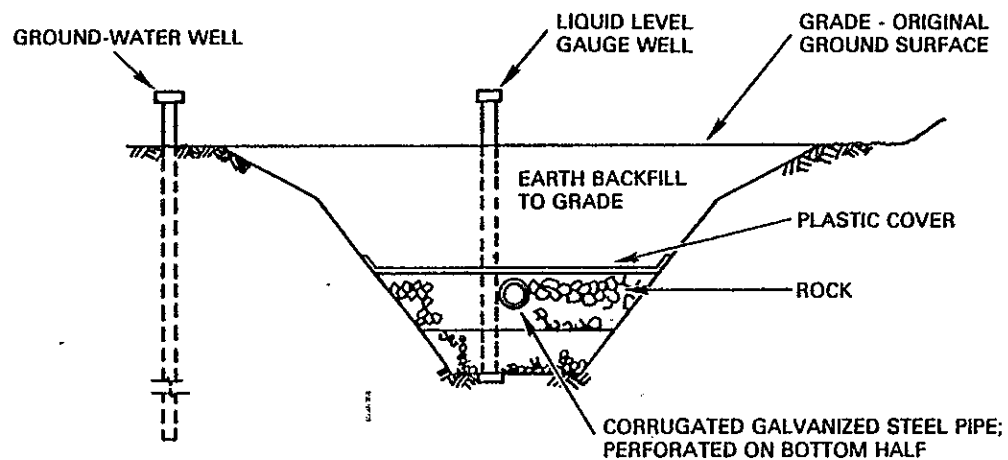
^b Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).

^c Not available.

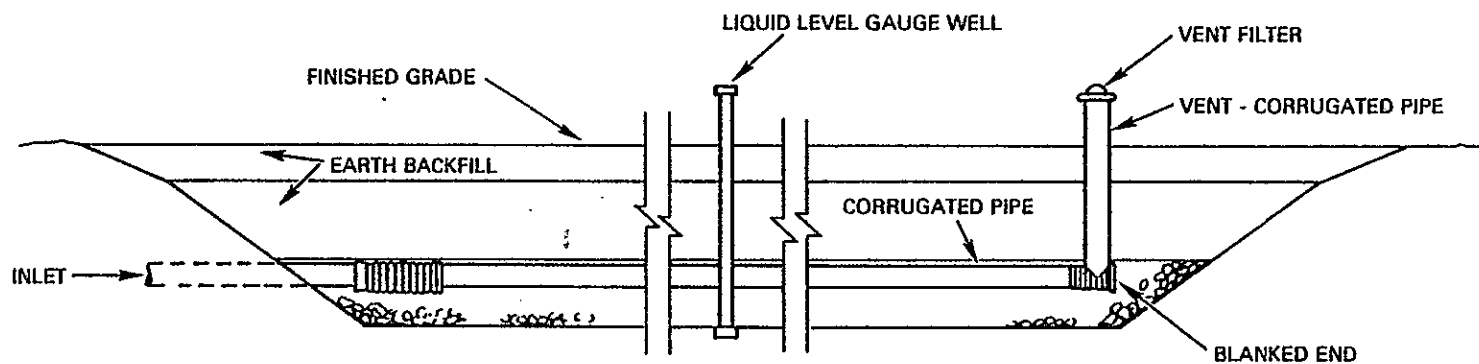
^d Maximum.

^e Minimum.

9 2 1 2 5 0 0 0 8 0 0



TYPICAL CRIB CROSS SECTION



TYPICAL CRIB LONG SECTION

2K8406-6.21

Figure 12. Typical Subsurface Liquid Waste Disposal Crib.

Table 8. Active Cribs in CY 1987.

Crib	Description of waste
216-A-8	241-A, AX, AY Tank Farms Steam coil condensate (A8)
216-A-10, 216-A-45 ^a	PUREX process condensate (PDD)
216-A-30, 216-A-37-2	PUREX steam condensate (SCD)
216-A-36B	PUREX ammonia scrubber waste (ASD)
216-A-37-1	242-A evaporator process condensate (AFPC)
216-B-55	B Plant steam condensate (BCS)
216-B-62	B Plant process condensate (BCP)
216-S-25	Effluent from ion exchange column, 242-S evaporator
216-S-26	Waste water from 222-S Laboratory
216-U-12	UO ₃ Plant process condensate (U-12)
216-W-LWC	Laundry waste water (LWC)
216-Z-20	Waste water from 231-Z and 234-5Z (231-Z and 2904-ZA)

^a216-A-10 deactivated and 216-A-45 activated March 1987.

PST88-3241-4

Wells 299-E25-06 and 299-E25-09 monitor this crib (see Figure A-3). Average concentrations of all monitored constituents are below the DCG and ACL. The concentrations determined in 1987 (Table 9) were similar to the results for 1986.

Long-term concentration histories for the monitoring wells at the 216-A-8 Crib are shown in Appendix D. Total beta, tritium, and nitrate concentrations determined for 1987 are in good general agreement with the decreasing long-term trend.

3.2.2 216-A-10 Crib

The 216-A-10 Crib received only $1.71 \text{ E} + 06$ gal ($6.47 \text{ E} + 06 \text{ L}$) of effluent in January 1987 before being deactivated and replaced by the 216-A-45 Crib (see Section 3.2.6). Disposal of ⁹⁰Sr to the crib during the 1960s created a plume that was migrating toward the ground water in the unsaturated zone beneath the crib. After sporadic use in the 1970s, the crib was reactivated in 1981, receiving acidic PUREX

process condensate (PDD) waste. In 1983, breakthrough to the ground water for the ⁹⁰Sr plume was estimated to occur in 3 to 6 yr. The 216-A-45 Crib was built as a replacement disposal facility and was activated in March 1987.

The ground water beneath this crib is monitored by wells 299-E17-01 and 299-E24-02 (see Figure A-4). Average concentrations of constituents monitored in these wells are listed in Table 10. While tritium concentrations exceed the DCG (which are applicable at the point of actual exposure to the public), the radiological parameters of ⁹⁰Sr, ¹³⁷Cs, ⁶⁰Co, and ¹⁰⁶Ru are below the DCG and the ACL. Concentrations of tritium and nitrate have increased slightly during 1987 as depicted in Figures 13 and 14, which reflect the operation of PUREX. The increase in tritium was predicted in DOE (1983). Tritium in the ground water at levels above the DCG is centered beneath the 216-A-10 Crib but encompasses the active 216-A-36B and 216-A-45 Cribs and the inactive 216-A-5 Crib (see Figure 10).

9 2 1 2 5 0 0 0 8 0 2

Table 9. Concentrations of Radiological Constituents and Nitrate in Ground Water Near the 216-A-8 Crib in 1987.

Well no.		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-E25-06	MAX ^a	1.60E+00	8.70E+00	3.39E+04	4.21E+00	3.30E-01	4.51E+01	5.56E+00	NN ^d	3.29E+00
	AVG ^b	1.10E+00	4.70E+00	1.10E+04	6.00E-02	1.10E-01	1.70E+01	4.22E+00		2.25E+00
	MIN ^c	2.00E-01	1.10E+00	4.38E+03	-3.54E+00	-1.80E-01	-2.24E+01	2.66E+00		1.53E+00
299-E25-09	MAX	1.60E+00	6.40E+00	4.32E+03	7.50E+00	7.00E-01	3.53E+01	8.95E+00	NN	2.50E+00
	AVG	7.00E-01	5.00E+00	3.36E+03	3.07E+00	3.60E-01	-7.97E+00	2.14E+00		1.94E+00
	MIN	1.00E-01	4.10E+00	2.36E+03	-1.52E+00	3.00E-02	-8.21E+01	-2.56E+00		1.34E+00

^a Maximum.

^b Average.

^c Minimum.

^d Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).

9 2 1 2 5 0 0 0 8 0 3

Table 10. Concentrations of Radiological Constituents and Nitrate for the Effluent and for Ground Water Near the 216-A-10 Crib in 1987.

		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
Effluent										
PUREX (PDD)	AVG ^a	4.00E+03	6.46E+02	4.80E+04	NA ^b	6.70E+01	<2.50E+02	<5.60E+01	8.20E-01	NA
Well										
299-E17-01	MAX ^c	3.40E+00	3.29E+01	9.27E+06	9.72E+00	6.94E+00	6.25E+01	6.42E+00	NNe	4.17E+02
	AVG	2.70E+00	2.81E+01	8.02E+06	2.79E+00	6.43E+00	4.90E+00	1.29E+00		3.52E+02
	MIN	1.40E+00	2.37E+01	6.84E+06	-3.75E+00	5.91E+00	-3.25E+01	-5.98E+00		2.46E+02
299-E24-02	MAX	6.50E+00	2.11E+01	4.85E+06	5.05E+00	3.34E+00	1.10E+02	3.33E+00	NN	2.04E+02
	AVG	5.00E+00	1.79E+01	4.19E+06	-3.07E+00	2.40E+00	3.39E+01	-3.35E+00		1.76E+02
	MIN ^d	3.90E+00	1.41E+01	3.83E+06	-8.56E+00	1.42E+00	5.91E+00	-8.66E+00		1.49E+02

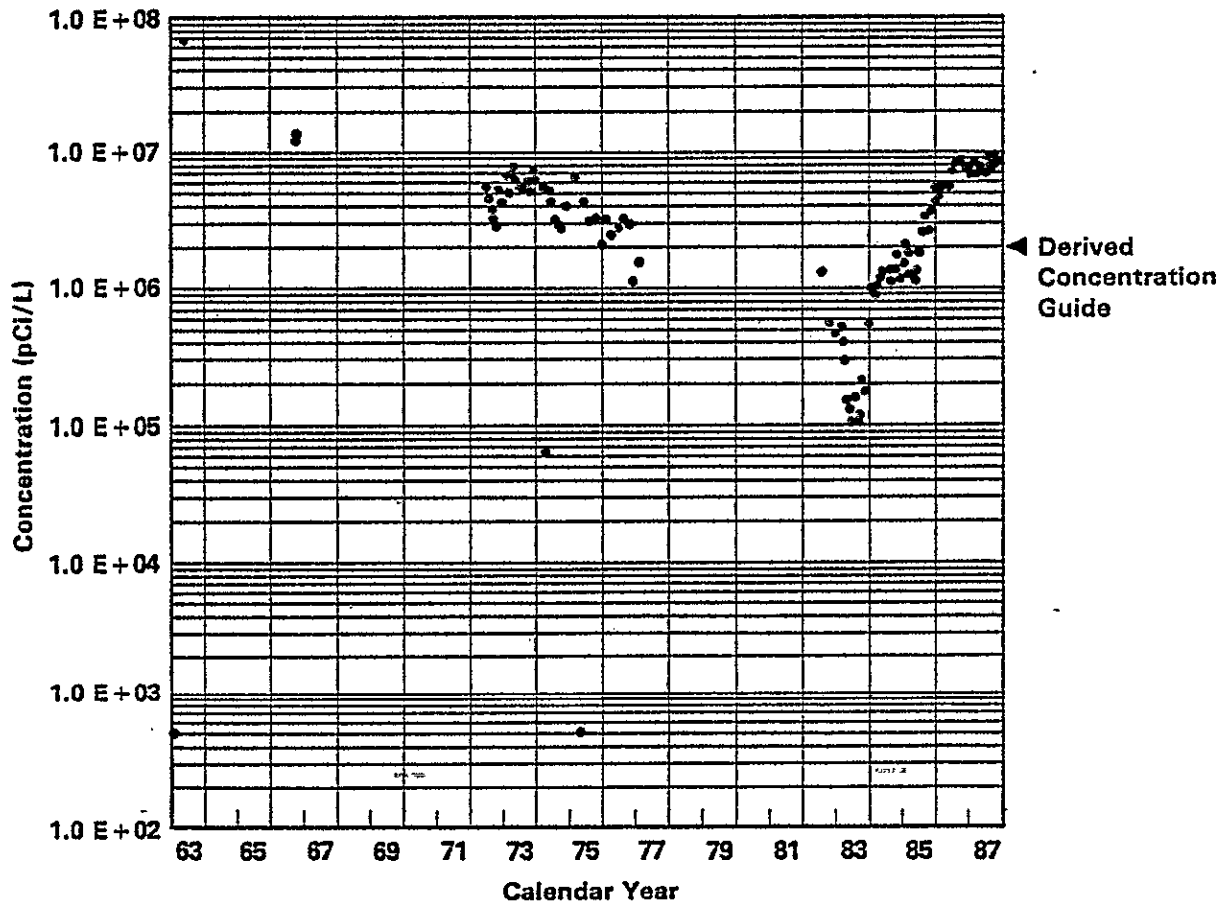
^a Average.

^b Not available.

^c Maximum.

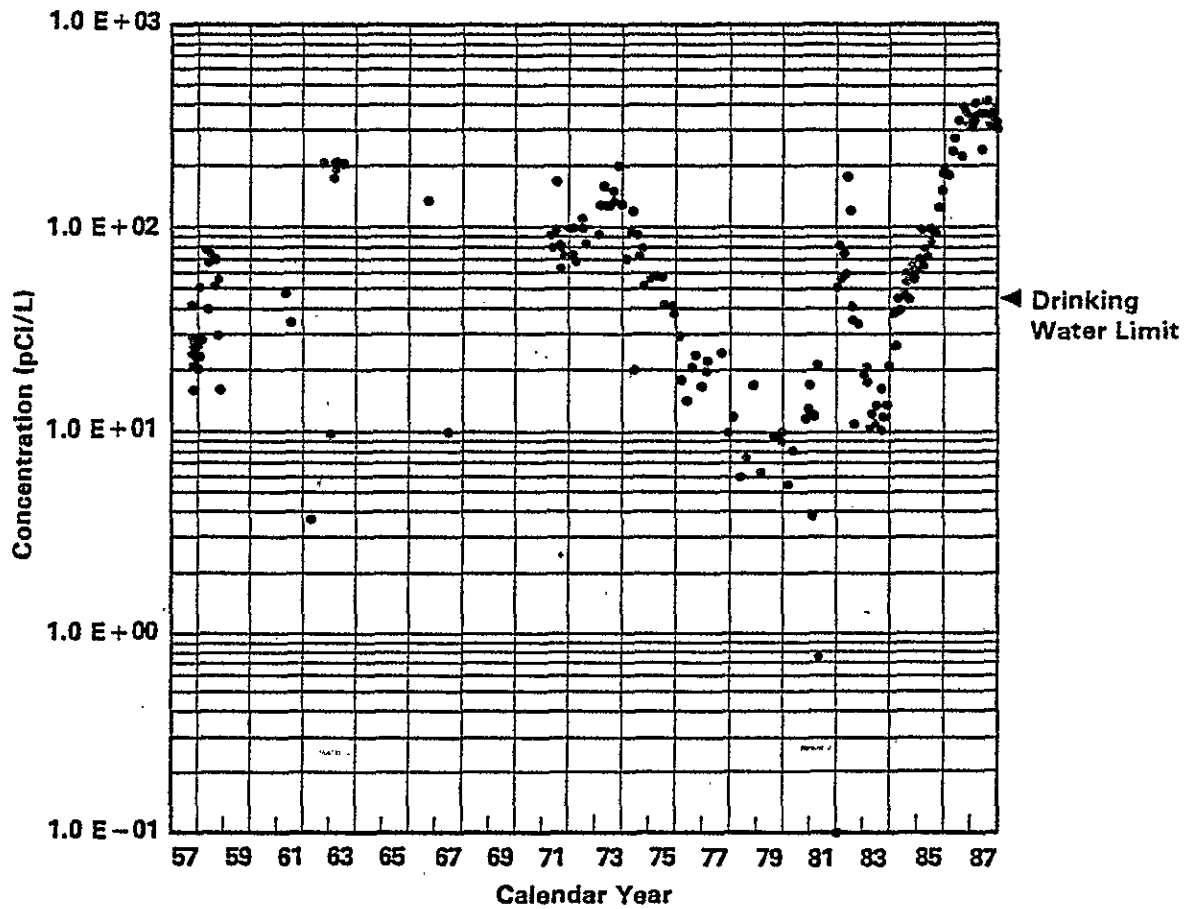
^d Minimum.

^e Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).



28803-025.5

Figure 13. Tritium Concentration History for Well 299-E17-01 at the 216-A-10 Crib.



28803-025.6

Figure 14. Nitrate Concentration History for Well 299-E17-01 at the 216-A-10 Crib.

Long-term concentration histories for the wells and effluent at the 216-A-10 Crib are shown in Appendix D. Concentrations of tritium and nitrate in the ground water, though higher than in 1986, began leveling off in 1987 because no significant discharge was sent to the crib in 1987.

3.2.3 216-A-30 Crib and 216-A-37-2 Crib

The 216-A-30 Crib and 216-A-37-2 Crib, both located just east of the 200 East Area (see Figure 10), receive steam condensate (SCD) waste from PUREX. The 216-A-30 Crib has been in continuous operation since 1961, with the exception of 1974 and 1975. The 216-A-37-2 Crib began operation in 1984 with the restart of PUREX. The SCD waste stream discharged $1.56 \text{ E} + 08 \text{ gal}$ ($5.93 \text{ E} + 08 \text{ L}$) to these cribs during 1987. About $1.05 \text{ E} + 08 \text{ gal}$ ($3.97 \text{ E} + 08 \text{ L}$) of the effluent went to the 216-A-30 Crib, with the remainder of the effluent, $5.17 \text{ E} + 07 \text{ gal}$, ($1.96 \text{ E} + 08 \text{ L}$) going to the 216-A-37-2 Crib.

The 216-A-30 Crib is monitored by wells 299-E16-02 and 299-E25-11 (see Figure A-6). The 216-A-37-2 Crib is monitored by four wells, 299-E25-21 through 299-E25-24 (Figure A-9). Monitoring results for 1987 are listed in Table 11. A comparison with results from the previous year reveals an increasing tritium concentration trend in well 299-E25-11 (Figure 15) accompanied by slight increases in total beta and nitrate. The tritium in this well remains below the DCG. Since tritium discharge to the 216-A-30 Crib is minimal, the increases are attributed to movement of tritium discharged to the nearby 216-A-37-1 Crib in 1985 and 1986. All other values remain essentially unchanged and all constituents are below the DCG and ACL.

The long-term concentration histories for wells 299-E16-02 and 299-E25-11 are shown in Figures D-7 and D-8 of Appendix D. Concentrations for 1987 are observed to fall within established trends.

3.2.4 216-A-36B Crib

Ammonia scrubber waste (ASD) discharged from PUREX is received by the 216-A-36B Crib (see Figure 12), which is located just south of the PUREX Plant. This disposal facility was active from 1966 to 1972 and was activated again in 1982. The crib was removed from service in August 1987 when it was confirmed that the waste stream contained reportable quantities of ammonium hydroxide. The ASD stream is being routed to Tank Farms until suitable ammonium treatment equipment can be installed.

Following shutdown of the crib, a study (Buel et al. 1988, WHC 1988) was conducted to evaluate the environmental impact of the ammonium hydroxide discharges. Although no effect on the radionuclide constituents, which are the topic of this report, is indicated, the investigation predicted that the primary impact to the ground water may be from an increase in nitrate. This occurs because studies showed that ammonium hydroxide may be converted to nitrate and nitrite by biological activity in the soil. Modeling showed nitrate increases of more than 300 ppm occurring at a distance of 2 km from the crib due to past ammonium discharges, most of which occurred since the 1984 start up of PUREX. Actual monitoring data do not confirm the predictions at this time.

Wells 299-E17-05 and 299-E17-09 monitor the 216-A-36B Crib (see Figure A-7). Data for 1987 are presented in Table 12. The average tritium concentrations in both wells exceed the DCG (which are applicable at the point of actual exposure to the public) but all other constituents are below the DCG and the internal ACL. The tritium concentration in well 299-E17-05 has increased over 1986 (Figure 16) but appears to be leveling off, while the concentration in well 299-E17-09 has begun to decrease slightly. Simultaneous increases in total beta, ^{106}Ru , and nitrate were observed in August 1987 in well 299-E17-05 and also in well 299-E24-12, which monitors the nearby inactive 216-A-21 Crib. The concentrations of these constituents peaked in September 1987 and have steadily declined

9 2 1 2 5 0 0 0 8 0 7

Table 11. Concentrations of Radiological Constituents and Nitrate for the Effluent and for Ground Water Near the 216-A-30 Crib and 216-A-37-2 Crib in 1987.

		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
Effluent										
PUREX (SCD)	AVG ^a	9.43E+01	3.22E+03	1.11E+03	NAB ^b	<4.03E+01	NN ^c	9.56E+01	NN	1.60E+00
Wells at 216-A-30 crib										
299-E16-02	MAX ^d	2.30E+00	1.81E+01	8.45E+03	8.51E+00	6.20E-01	5.06E+01	8.21E+00	NN	7.02E+00
	AVG	1.50E+00	1.29E+01	4.46E+03	5.00E-02	1.90E-01	-1.40E-01	-7.80E-01		3.97E+00
	MIN ^e	9.00E-01	9.80E+00	1.81E+03	-8.12E+00	-2.30E-01	-6.07E+01	-1.10E+01		1.36E+00
299-E25-11	MAX	1.80E+00	1.50E+01	6.02E+05	8.54E+00	2.61E+00	5.11E+01	8.99E+00	NN	5.50E+01
	AVG	1.10E+00	1.11E+01	4.21E+05	-2.70E-01	7.60E-01	-8.38E+00	-3.20E-01		3.80E+01
	MIN	5.00E-01	8.80E+00	2.93E+05	-1.12E+01	2.00E-02	-6.88E+01	-1.31E+01		2.80E+01
Wells at 216-A-37-2 crib										
299-E25-21	MAX	2.30E+00	1.47E+01	9.09E+03	9.84E+00	9.60E-01	5.07E+01	5.55E+00	NN	1.24E+01
	AVG	1.60E+00	1.12E+01	4.72E+03	1.84E+00	2.90E-01	-1.22E+01	-1.00E+00		9.01E+00
	MIN	9.00E-01	9.00E+00	2.45E+03	-9.12E+00	-1.60E-01	-9.40E+01	-1.09E+01		5.72E+00
299-E25-22	MAX	1.50E+00	1.09E+01	1.34E+04	9.74E+00	8.40E-01	6.99E+01	1.02E+01	NN	7.04E+00
	AVG	1.00E+00	6.20E+00	6.94E+03	-2.06E+00	4.00E-01	-1.86E+00	1.29E+00		5.27E+00
	MIN	6.00E-01	3.50E+00	4.67E+03	-1.02E+01	3.00E-02	-1.44E+02	-1.12E+01		4.30E+00
299-E25-23	MAX	1.50E+00	1.89E+01	1.59E+03	4.05E+00	1.50E-01	9.55E+01	8.48E+00	NN	4.03E+00
	AVG	1.00E+00	1.49E+01	6.09E+02	-6.30E-01	1.00E-02	3.39E+01	1.81E+00		2.86E+00
	MIN	7.00E-01	1.32E+01	1.71E+02	-6.42E+00	-1.40E-01	2.83E+00	-4.48E+00		2.30E+00
299-E25-24	MAX	1.30E+00	2.22E+01	3.15E+03	1.12E+01	2.90E-01	9.04E+01	1.07E+01	NN	5.30E+00
	AVG	1.00E+00	1.50E+01	1.06E+03	3.66E+00	1.50E-01	1.62E+01	-2.80E-01		3.14E+00
	MIN	7.00E-01	8.10E+00	4.90E+02	-4.29E+00	3.00E-02	-4.08E+01	-7.89E+00		2.50E+00

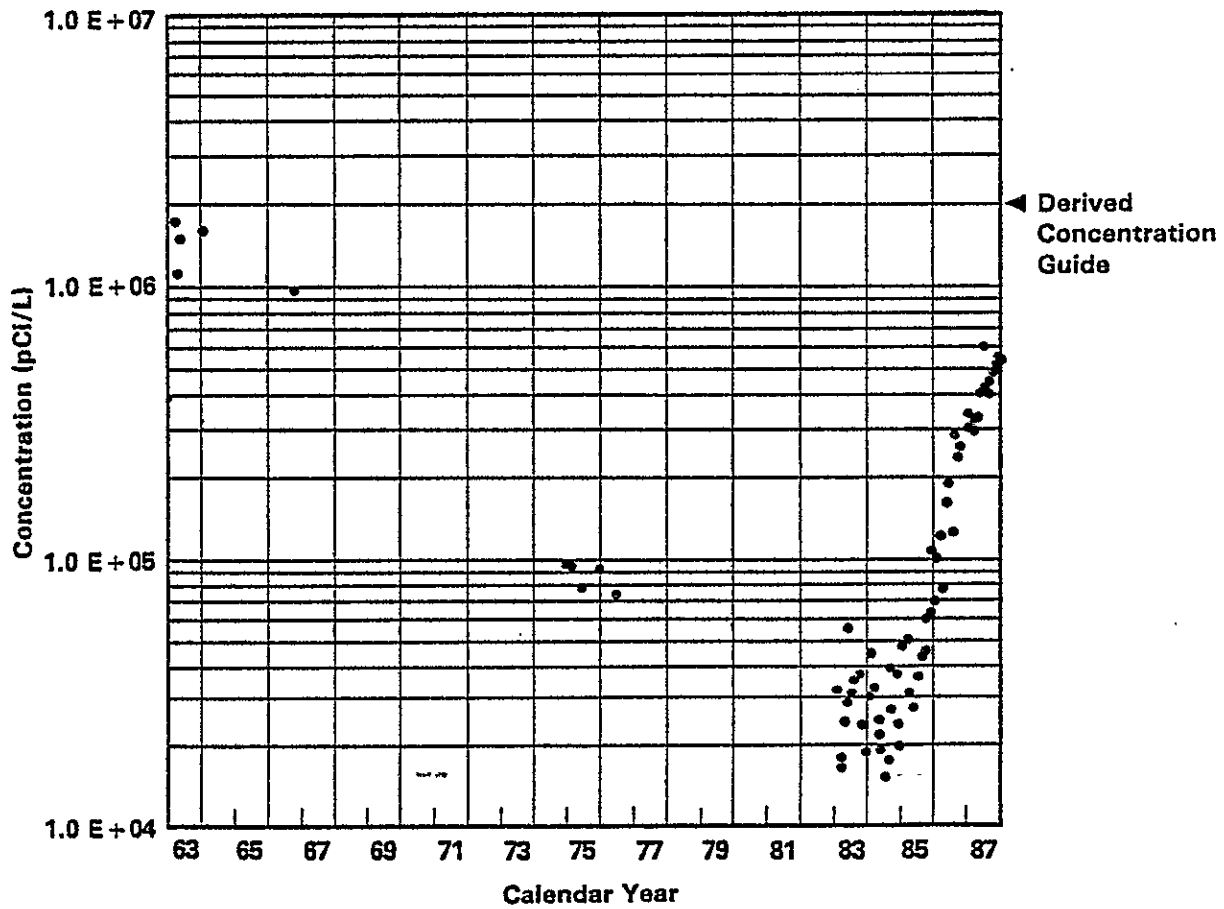
^a Average.

^b Not available.

^c Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).

^d Maximum.

^e Minimum.



28803-025.7

Figure 15. Tritium Concentration History for Well 299-E25-11 at the 216-A-30 Crib.

9 2 1 2 5 0 0 0 8 0 9

Table 12. Concentrations of Radiological Constituents and Nitrate for the Effluent and for Ground Water Near the 216-A-36B Crib in 1987.

		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
Effluent										
PUREX (ASD)	AVG ^a	<9.01E+01	2.71E+04	1.41E+06	NA ^b	8.68E+02	1.48E+04	3.31E+03	NN ^c	<5.00E-01
Well										
299-E17-05	MAX ^d	8.90E+00	7.24E+02	5.39E+06	6.22E+01	6.78E+00	5.57E+02	7.94E+00	7.27E+00	2.76E+02
	AVG	8.80E+00	2.09E+02	4.32E+06	1.63E+01	3.78E+00	1.08E+02	3.90E-01	5.64E+00	1.40E+02
	MIN ^e	5.80E+00	5.26E+01	3.89E+06	-9.11E+00	2.52E+00	-5.43E+01	-5.99E+00	4.01E+00	7.52E+01
299-E17-09	MAX	4.20E+00	3.40E+01	6.29E+06	5.61E+00	3.43E+00	1.12E+02	8.55E+00	2.99E+00	1.70E+02
	AVG	3.10E+00	2.35E+01	5.10E+06	-1.40E+00	3.19E+00	2.01E+01	-1.11E+00	2.44E+00	1.39E+02
	MIN	2.10E+00	1.42E+01	3.61E+06	-1.07E+01	2.75E+00	-5.42E+01	-1.59E+01	1.90E+00	1.14E+02

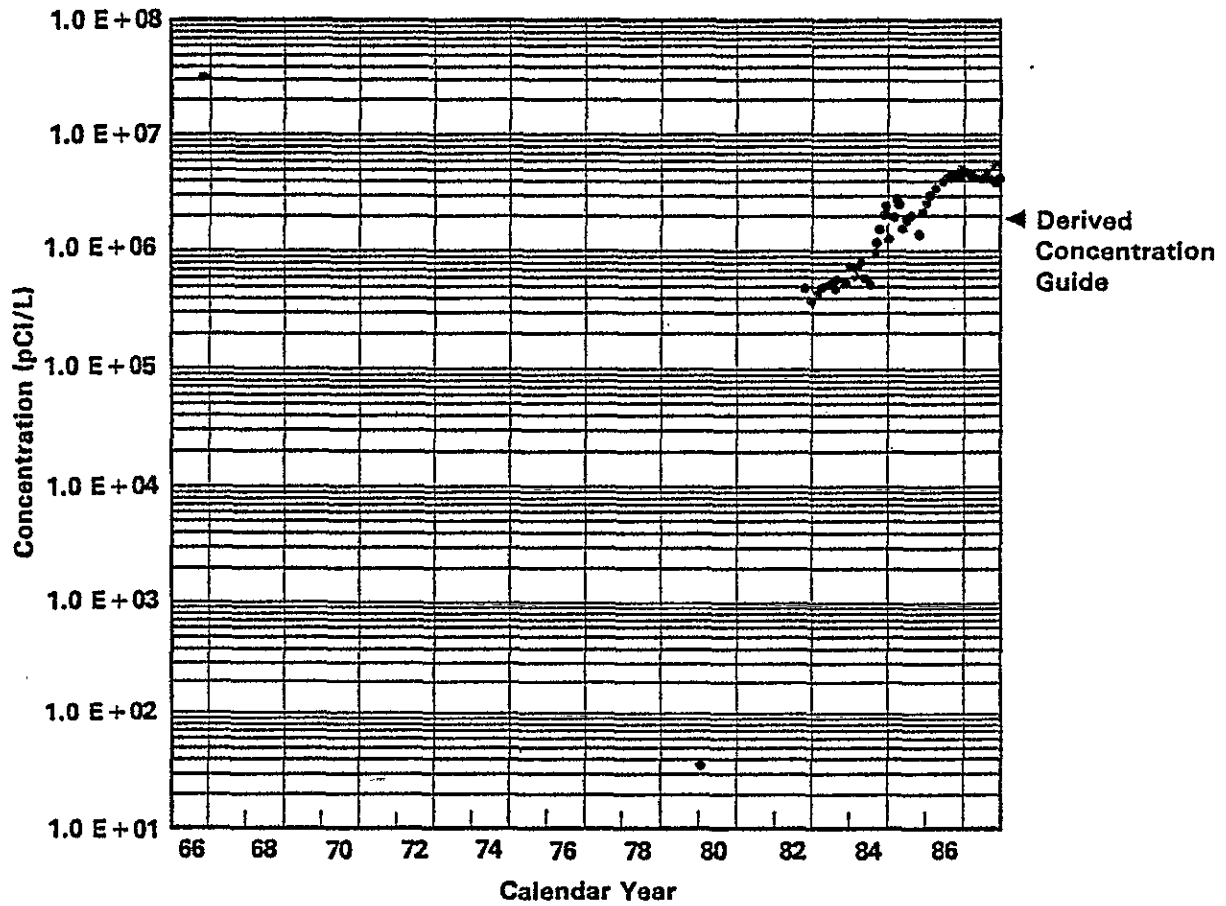
^a Average.

^b Not available.

^c Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).

^d Maximum.

^e Minimum.



28803-025.3

Figure 16. Tritium Concentration History for Well 299-E17-05 at the 216-A-36B Crib.

since, with December 1987 values only slightly higher than concentrations observed before the increases. The total beta concentration history graph for well 299-E17-05 (Figure 17) is typical of the type of pattern observed in the other two constituents and at the other well. The origin of this contamination spike is believed to be the 216-A-36B Crib because ^{106}Ru is a significant component of the ASD stream. Except for tritium, none of the monitored constituents exceed the DCG or ACL.

The long-term concentration histories for the two monitoring wells and the effluent stream at the 216-A-36B Crib are shown in Appendix D. The influence of the contamination spike at well 299-E17-05 is seen in the higher total beta average. Tritium results are in general agreement with previous results.

3.2.5 216-A-37-1 Crib

Process condensate from the 242-A Evaporator (AFPC) is disposed to the 216-A-37-1 Crib after retention and monitoring in the concrete 207-A Retention Basin. The crib is located outside the 200 East Area, just east of the evaporator (see Figure 10). The waste stream has been active since 1977, and in 1987 a total of $6.46 \text{ E} + 06 \text{ gal}$ ($2.4 \text{ E} + 07 \text{ L}$) of effluent was disposed to the crib.

The crib is monitored by four wells, 299-E25-17 through 299-E25-20 (Figure A-8). The monitoring results for 1987 are contained in Table 13. The average tritium concentration in well 299-E25-19 was above the DCG (which is applicable at the point of actual exposure to the public) during 1987 after peaking in March at $6.83 \text{ E} + 06 \text{ pCi/L}$ (Figure 18). Smaller tritium increases during the early part of 1987, followed by returns to 1986 levels later in the year, were observed in the three other monitoring wells at the crib. The tritium increase in well 299-E25-19 was accompanied by a similar response in total beta concentration (Figure 19). Except for tritium in well 299-E25-19, all other results were below DCG and ACL during 1987.

Long-term concentration histories for the effluent and ground water are shown in Appendix D. Increases in tritium concentrations in the ground water are apparent and may reflect the higher levels of tritium seen in the effluent stream.

3.2.6 216-A-45 Crib

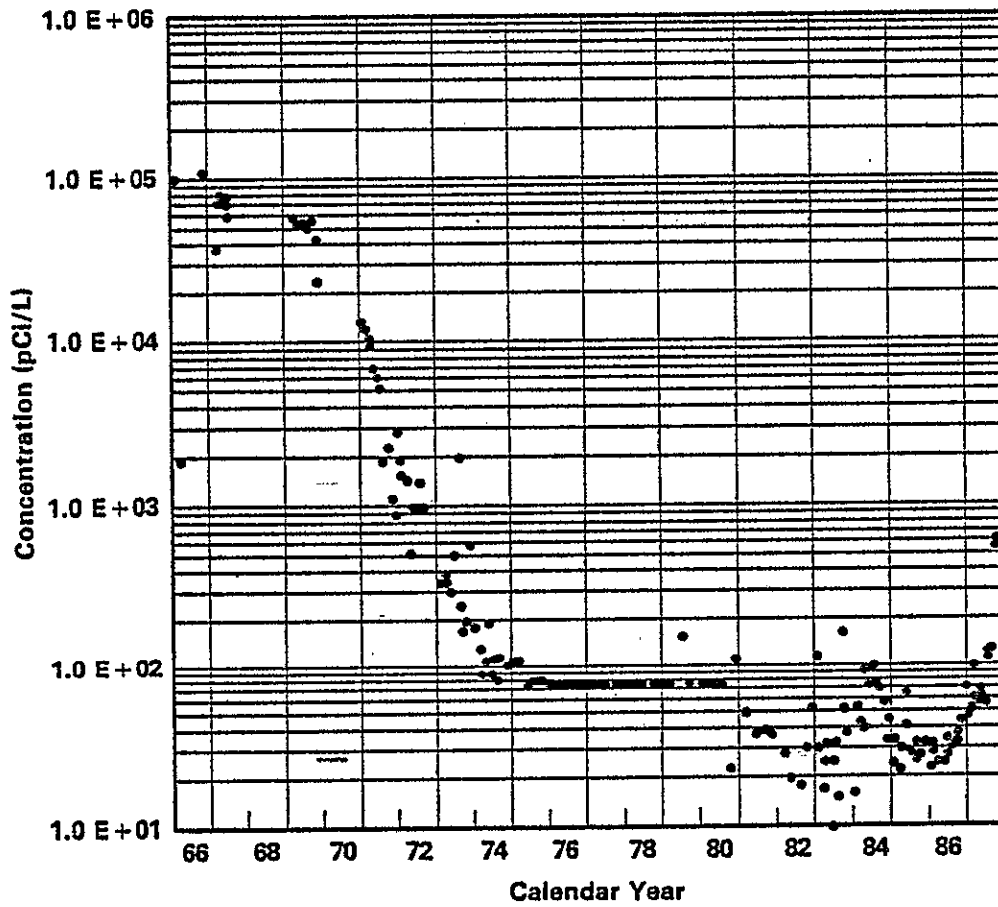
The 216-A-45 Crib was constructed in 1986 to replace the 216-A-10 Crib (see Section 3.2.2). The crib is located south of the PUREX plant close to the 216-A-10 and 216-A-36B Crib (see Figure 10). The PDD waste line was diverted from the 216-A-10 Crib and tied into the 216-A-45 Crib in March 1987. During the remainder of the year, the crib received $1.18 \text{ E} + 07 \text{ gal}$ ($4.48 \text{ E} + 07 \text{ L}$) of effluent.

Two ground water wells, 299-E17-12 and 299-E17-13 (see Figure A-10), were drilled to monitor the crib. Baseline monitoring data were collected from mid-1986 until the crib began receiving effluent. Table 14 lists the average radionuclide concentrations in the two wells during 1987. The average tritium concentration in well 299-E17-13 exceeded the DCG (applicable at the point of actual exposure to the public), but all other results are below guidelines. The tritium contamination was present prior to crib startup and can be attributed to past disposal to the nearby 216-A-10 Crib. No changes in concentration that can be directly attributed to the startup of 216-A-45 have been observed in the data.

Long-term concentration history graphs are not appropriate for this crib.

3.2.7 216-B-55 Crib

The 216-B-55 Crib is located west of B Plant in the northwestern part of 200 East Area (see Figure 10). Steam condensate waste (BCS) from B Plant was disposed of to the crib between 1967 and 1986. No effluent was discharged to the crib in 1987, although the crib remains on active status.



28803-025.9

Figure 17. Total Beta Concentration History for Well 299-E17-05 at the 216-A-36B Crib.

9 2 1 2 5 0 0 0 8 1 3

Table 13. Concentrations of Radiological Constituents and Nitrate for the Effluent and for Ground Water Near the 216-A-37-1 Crib in 1987.

		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
Effluent										
242-A (AFPC)	AVG ^a	<2.24E+01	1.51E+03	6.27E+06	NA ^b	<2.47E+02	NN ^c	<2.00E+02	NN	3.50E+00
Well										
299-E25-17	MAX ^d	1.50E+00	1.78E+01	5.02E+05	-1.70E+00	1.22E+00	3.98E+01	5.00E+00	NN	2.65E+01
	AVG	1.10E+00	1.03E+01	3.64E+05	-6.45E+00	5.80E-01	-2.95E+00	2.17E+00		1.64E+01
	MIN ^e	1.00E-01	6.30E+00	1.79E+05	-1.50E+01	-2.30E-01	-3.11E+01	-6.70E-01		7.75E+00
299-E25-18	MAX	1.80E+00	1.17E+01	3.12E+05	7.93E+00	2.34E+00	5.38E+01	8.33E+00	NN	2.67E+01
	AVG	1.30E+00	7.50E+00	1.71E+05	-7.90E-01	6.70E-01	1.25E+01	1.27E+00		1.63E+01
	MIN	1.00E+00	4.40E+00	6.70E+04	-1.17E+01	5.00E-02	-5.34E+01	-7.03E+00		9.55E+00
299-E25-19	MAX	1.70E+00	1.19E+02	6.83E+06	6.09E+00	4.10E-01	1.46E+01	6.81E+00	NN	2.57E+02
	AVG	1.10E+00	5.44E+01	3.97E+06	1.77E+00	-4.00E-02	-4.00E+01	4.13E+00		1.67E+02
	MIN	4.00E-01	9.30E+00	4.23E+05	-3.56E+00	-6.30E-01	-1.23E+02	3.20E-01		6.27E+01
299-E25-20	MAX	2.40E+00	1.78E+01	8.58E+05	5.61E+00	1.60E-01	8.67E+01	8.55E+00	NN	2.29E+02
	AVG	1.80E+00	1.37E+01	6.08E+05	6.20E-01	7.00E-02	5.71E+01	5.98E+00		1.70E+02
	MIN	1.20E+00	9.20E+00	2.86E+05	-5.35E+00	-1.30E-01	1.41E+01	-6.70E-01		1.32E+02

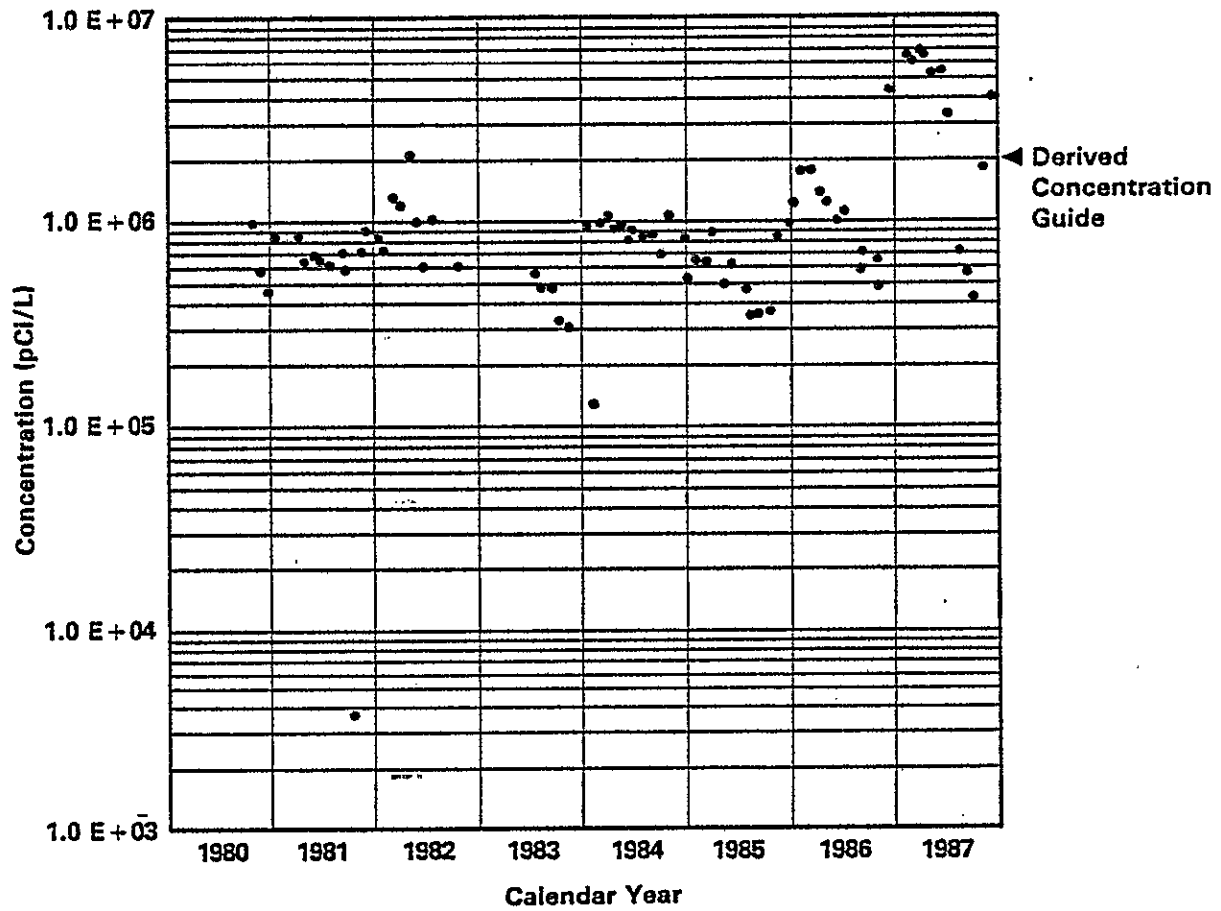
^a Average.

^b Not available.

^c Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).

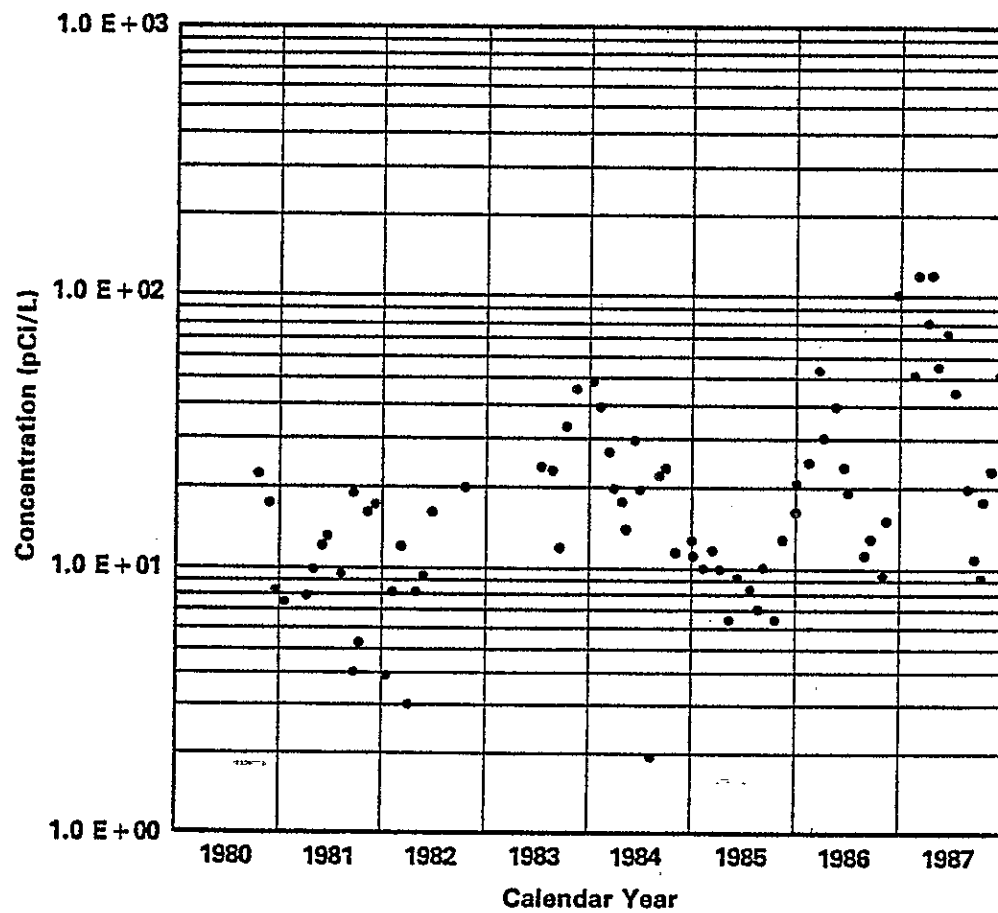
^d Maximum.

^e Minimum.



28803-025.10

Figure 18. Tritium Concentration History for Well 299-E25-19 at the 216-A-37-1 Crib.



28803-025.11

Figure 19. Total Beta Concentration History for Well 299-E25-19 at the 216-A-37-1 Crib.

Table 14. Concentrations of Radiological Constituents and Nitrate for the Effluent and for Ground Water Near the 216-A-45 Crib in 1987.

		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
Effluent										
PUREX (PDD)	AVG ^a	5.88E+02	5.71E+02	3.38E+07	NA ^b	<9.86E+01	<4.85E+02	<4.90E+01	8.98E+00	3.00E+00
Well										
299-E17-12	MAX ^c	4.90E+00	4.56E+01	3.09E+06	8.55E+00	6.10E-01	8.28E+01	7.18E+00	4.01E+00	1.17E+02
	AVG	3.70E+00	2.57E+01	1.66E+06	-7.00E-02	6.00E-02	2.84E+01	-8.00E-01	2.99E+00	6.28E+01
	MIN ^d	1.80E+00	1.48E+01	2.54E+05	-9.01E+00	-2.10E-01	-2.67E+01	-1.93E+01	1.70E+00	2.42E+01
299-E17-13	MAX	7.70E+00	3.89E+01	3.63E+06	8.41E+00	7.40E-01	5.91E+01	8.13E+00	5.84E+00	1.51E+02
	AVG	5.40E+00	2.43E+01	2.37E+06	1.34E+00	3.90E-01	-2.21E+01	9.00E-02	4.07E+00	9.11E+01
	MIN	3.10E+00	1.07E+01	1.14E+06	-1.12E+01	1.00E-01	-1.11E+02	-6.33E+00	3.06E+00	3.35E+01

^a Average.

^b Not available.

^c Maximum.

^d Minimum.

Wells 299-E28-12 and 299-E28-13 monitor this crib (Figure A-13). Concentrations of all radionuclides are observed to be below the DCG and ACL. Results of the monitoring for 1987 are listed in Table 15 and are typical for this crib as illustrated in the long-term concentration history graphs shown in Appendix D.

3.2.8 216-B-62 Crib

Process condensate from B Plant (BCP) has been routed to the 216-B-62 Crib, which is located northwest of B Plant (see Figure 10), since 1973, though in 1987 no effluent was discharged to the crib.

Wells 299-E28-18 and 299-E28-21 (Figure A-14) provide monitoring capability for this crib. Table 16 summarizes the data obtained during 1987. This crib has had elevated uranium concentrations in the ground water for several years (Law et al. 1987). The concentrations of uranium have been declining and are below the DCG but still above the Westinghouse Hanford internal ACL. Should the decline continue at the present rate, the uranium concentrations in both wells will drop below the ACL by the end of 1988. Isotopic uranium results, which can be directly compared with established ACL, are listed in Table B-3 of Appendix B. Results of an evaluation indicated that the uranium was not from the 216-B-62 Crib, but most likely originated from the inactive 216-B-12 Crib, located several hundred feet to the south.

Long-term concentration history graphs for this crib, shown in Appendix D, indicate that 1987 concentrations are consistent with previous data.

3.2.9 216-S-25 Crib

The 216-S-25 Crib is located just outside the 200 West Area fence and south of the deactivated 216-U-10 Pond (see Figure 11). The

crib received process condensate from the 242-S Evaporator from 1973 to 1980, and in 1985 was activated for a 6-mo period to receive effluent from the ion-exchange column in the evaporator that treated ground water pumped from the vicinity of the 216-U-1/2 Crib. No effluent was discharged to the 216-S-25 Crib in 1986 or 1987, but the facility remains on active status.

The crib is monitored by three wells, 299-W23-09 through 299-W23-11 (Figure A-16). Table 17 is a summary of the results from monitoring in 1987. Although all radionuclides are below the DCG and ACL, concentrations of uranium are increasing slightly in all three wells while tritium and nitrate rose sharply toward the end of 1986 but have leveled off during 1987. Increases in uranium and nitrate can be attributed to operation of the ion-exchange column in 1985 or to movement of contamination from U-Pond, but a source for tritium has not been identified.

3.2.10 216-S-26 Crib

The 216-S-26 Crib receives steam condensate and sink waste from the 222-S Laboratory. The crib is located south of the 222-S Laboratory just outside the 200 West Area perimeter fence (Figure 10). Operation of the crib commenced in 1984 as a replacement for the 216-S-19 Pond. During 1987, the crib received $9.08 \text{ E} + 06 \text{ gal}$ ($3.44 \text{ E} + 07 \text{ L}$) of effluent.

The crib is monitored by well 299-W27-01 (Figure A-17). Average concentrations of radionuclides in the ground water near the crib (Table 18) are below the DCG and the ACL.

3.2.11 216-U-12 Crib

The UO_3 Plant in 200 West Area supports the operation of PUREX. The process condensate effluent stream (U-12) from this

Table 15. Concentrations of Radiological Constituents and Nitrate for Ground Water Near the 216-B-55 Crib in 1987.

Well no.		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-E28-12	MAX ^a		2.04E+01	4.01E+05	6.09E+00		4.87E+01	7.18E+00		
	AVG ^b	NN	1.54E+01	1.46E+05	-1.00E+00	NN ^d	-2.55E+00	1.40E-01	NN	NN
	MIN ^c		9.40E+00	7.02E+04	-1.64E+01		-3.85E+01	-6.89E+00		
299-E28-13	MAX		9.50E+00	8.98E+03	4.51E+00		4.65E+01	5.98E+00		
	AVG	NN	8.20E+00	6.70E+03	1.91E+00	NN	-3.11E+00	2.80E+00	NN	NN
	MIN		7.00E+00	5.30E+03	1.01E+00		-5.35E+01	-1.59E+00		

^a Maximum.^b Average.^c Minimum.^d Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).

Table 16. Concentrations of Radiological Constituents and Nitrate for Ground Water Near the 216-B-62 Crib in 1987.

Well no.		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-E28-18	MAX ^a	9.41E+01	2.68E+01	1.19E+04	7.01E+00	9.40E-01	4.38E+01	5.67E+00	8.22E+01	7.33E+01
	AVG ^b	5.51E+01	1.91E+01	7.98E+03	2.40E+00	3.80E-01	-3.87E+00	-3.10E-01	4.98E+01	5.13E+01
	MIN ^c	3.66E+01	1.46E+01	5.13E+03	-9.13E+00	5.00E-02	-4.03E+01	-1.67E+01	3.48E+01	3.61E+01
299-E28-21	MAX	5.57E+01	1.95E+01	9.59E+03	9.73E+00	1.19E+00	6.98E+01	7.18E+00	5.38E+01	4.47E+01
	AVG	4.54E+01	1.54E+01	6.85E+03	3.04E+00	5.10E-01	-3.60E+00	7.30E-01	4.34E+01	4.04E+01
	MIN	3.05E+01	1.03E+01	4.80E+03	-7.96E+00	1.10E-01	-8.34E+01	-1.07E+01	3.00E+01	3.07E+01

^a Maximum.^b Average.^c Minimum.

Table 17. Concentrations of Radiological Constituents and Nitrate in Ground Water Near the 216-S-25 Crib in 1987.

Well no.		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-W23-09	MAX ^a	4.84E+01	2.24E+01	1.55E+06	6.11E+00	4.80E-01	4.55E+01	9.82E+00	4.97E+01	4.09E+02
	AVG ^b	2.73E+01	1.26E+01	1.29E+06	1.44E+00	2.40E-01	3.10E-01	1.67E+00	2.70E+01	2.10E+02
	MIN ^c	1.43E+01	8.70E+00	7.76E+05	-6.83E+00	-2.30E-01	-5.55E+01	-1.29E+01	1.83E+01	7.71E+01
299-W23-10	MAX	4.47E+01	3.40E+01	1.02E+06	5.05E+00	8.00E-01	5.33E+01	6.39E+00	4.66E+01	2.28E+02
	AVG	3.62E+01	2.05E+01	7.01E+05	2.40E-01	1.70E-01	1.01E+01	7.70E-01	3.47E+01	1.93E+02
	MIN	2.42E+01	1.32E+01	3.08E+05	-6.40E+00	-2.40E-01	-3.87E+01	-6.84E+00	2.70E+01	1.38E+02
299-W23-11	MAX	4.26E+01	1.99E+01	8.51E+04	1.41E+00	NN ^d	4.80E+01	1.71E+00	2.15E+01	2.75E+00
	AVG	2.16E+01	1.11E+01	2.12E+04	-3.30E+00		-3.28E+01	-3.80E-01	1.59E+01	2.55E+00
	MIN	1.79E+01	7.00E+00	1.00E+03	-1.01E+01		-1.15E+02	-2.57E+00	1.26E+01	2.50E+00

^a Maximum.^b Average.^c Minimum.^d Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).

9 2 1 2 5 0 0 0 8 2 1

Table 18. Concentrations of Radiological Constituents and Nitrate for the Effluent and for Ground Water Near the 216-S-26 Crib in 1987.

		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
Effluent										
222-S Laboratory	AVG ^a	<2.54E+00	<1.52E+01	NN ^b	NAC ^c	<8.88E+00	NN	<3.28E+01	NN	1.10E+00
Well										
299-W27-01	MAX ^d	1.03E+01	1.02E+01	1.45E+04	1.22E+01	7.30E-01	1.02E+02	5.51E+00	6.31E+00	1.18E+02
	AVG	7.40E+00	7.50E+00	5.78E+03	3.24E+00	2.70E-01	3.20E+01	4.30E+00	5.16E+00	1.05E+02
	MIN ^e	5.30E+00	5.70E+00	1.08E+02	-2.84E+00	-3.70E-01	-1.08E+01	1.28E+00	4.07E+00	7.82E+01

^a Average.

^b Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).

^c Not available.

^d Maximum.

^e Minimum.

plant is discharged to the 216-U-12 Crib (see Figure 11). This crib will be replaced by the newly constructed 216-U-17 Crib (see Section 3.2.12). The volume of effluent in 1987 was $1.69 \text{ E} + 05 \text{ gal}$ ($6.40 \text{ E} + 05 \text{ L}$).

The monitoring well for this crib is 299-W22-22 (Figure A-21). Average concentrations of radionuclides in this well (Table 19) are below the DCG and the ACL. These concentrations are similar to those reported in 1986.

Long-term concentration history for the monitoring well at this crib, shown in Appendix D, provides a comparison with previous operation of the crib.

3.2.12 216-U-17 Crib

Construction of the 216-U-17 Crib was completed in 1987 as a replacement for the 216-U-12 Crib (see Section 3.2.11), but the crib did not receive effluent in 1987. The baseline monitoring that occurred at the crib last year is reported here for informational purposes.

Baseline data for the 216-U-17 Crib are collected from six wells that surround the facility (Figure A-23). Two wells, 299-W19-19 and 299-W19-20, were originally planned for ground-water monitoring; however, after elevated uranium readings were found during initial sampling, four more wells, 299-W19-23 through 299-W19-26, were constructed in May 1987. The 1987 baseline data summarized in Table 20 and Table B-3 of Appendix B indicate that uranium concentrations in all six wells already exceed the ACL. Since no effluent had been discharged to the crib the contamination must originate from some other facility. An investigation designed to characterize the extent and identify the source of

the contamination beneath 216-U-17 Crib is planned for FY 1989.

3.2.13 216-W-LWC Crib

Liquid wastes from the laundry building are directed to the 216-W-LWC Crib in 200 West Area (see Figure 11). This crib was placed into operation in 1981, and during 1987 received $1.60 \text{ E} + 07 \text{ gal}$ ($6.08 \text{ E} + 07 \text{ L}$) of effluent. Part of the crib was excavated in late 1987 to clean out a plugged distribution pipe, but discharge to the crib was uninterrupted.

Well 299-W14-10 (Figure A-24) monitors this crib. Average concentrations of radionuclides and the effluent streams are listed in Table 21. Concentrations were below the DCG and the ACL and similar to last year.

3.2.14 216-Z-20 Crib

The 216-Z-20 Crib receives effluent (231-Z and 2904-ZA waste streams) from the 231-Z and 234-5Z Buildings. The crib is located south of the 234-5Z Building in 200 West Area (see Figure 11), and became operational in 1981. In September 1987, an uncontaminated, nonhazardous component of the 2904-ZA stream amounting to about 25% of the total discharge to the crib was routed to the 216-Z-21 Basin because poor infiltration into the 216-Z-20 Crib necessitated a reduction in flow. The total discharge to the crib amounted to $6.5 \text{ E} + 07 \text{ gal}$ ($2.49 \text{ E} + 08 \text{ L}$) in 1987.

The 216-Z-20 Crib has ground-water monitoring wells along the length of the crib, identified as 299-W18-17, 299-W19-18 and 299-W18-20 (Figure A-25). Results of the analyses for 1987 (Table 22) are all below the DCG and the ACL and similar to the low values observed in 1986.

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Table 19. Concentrations of Radiological Constituents and Nitrate for the Effluent and for Ground Water Near the 216-U-12 Crib in 1987.

		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
Effluent										
UO ₂ Plant	AVG ^a	9.23E+02	9.27E+02	NN ^b	NA ^c	NN	NN	NN	1.47E+03	8.90E+01
Well										
299-W22-22	MAX ^d	1.10E+00	5.10E+00	2.10E+03	7.49E+00	7.80E-01	4.77E+01	1.07E+01	8.15E-01	4.08E+00
	AVG	6.00E-01	3.30E+00	1.88E+03	2.19E+00	2.90E-01	3.39E+00	3.90E-01	4.07E-01	2.04E+00
	MIN ^e	1.00E-01	-3.00E-01	1.59E+03	-9.84E+00	-1.70E-01	-2.53E+01	-7.94E+00	6.79E-02	5.00E-01

^a Average.

^b Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).

^c Not available.

^d Maximum.

^e Minimum.

Table 20. Concentrations of Radiological Constituents and Nitrate in Ground Water Near the 216-U-17 Crib in 1987.

Well no.		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-W19-19	MAX ^a	5.05E+02	5.18E+02	3.57E+03	6.07E+00	9.30E-01	5.91E+01	5.86E+00	5.14E+02	1.50E+03
	AVG ^b	3.86E+02	2.84E+02	1.67E+03	1.70E-01	4.00E-01	1.13E+01	1.06E+00	3.78E+02	1.27E+03
	MIN ^c	2.72E+02	1.80E+02	1.19E+03	-1.02E+01	-1.00E-01	-3.54E+01	-3.44E+00	2.82E+02	1.10E+03
299-W19-20	MAX	3.44E+02	1.15E+03	1.85E+03	1.67E+01	6.70E-01	8.69E+01	6.88E+01	4.69E+02	1.07E+03
	AVG	2.52E+02	6.35E+02	1.46E+03	2.50E+00	3.30E-01	1.09E+01	4.04E+00	2.87E+02	8.88E+02
	MIN	1.54E+02	1.33E+02	8.18E+02	-3.70E+00	-1.30E-01	-3.33E+01	-8.32E+00	1.34E+02	1.01E+02
299-W19-23	MAX	1.71E+02	3.45E+02	1.23E+03	3.47E+00	6.20E+00	1.64E+01	3.58E+00	1.56E+02	5.75E+02
	AVG	1.35E+02	2.30E+02	1.04E+03	8.80E-01	9.80E-01	-1.18E+01	4.90E-01	1.40E+02	4.82E+02
	MIN	8.57E+01	8.57E+01	8.47E+02	-3.51E+00	-7.40E-01	-6.41E+01	-4.27E+00	1.26E+02	1.05E+02
299-W19-24	MAX	5.48E+02	1.44E+03	2.30E+03	6.43E+00	1.95E+00	6.47E+01	3.20E-01	5.00E+02	1.50E+03
	AVG	4.35E+02	9.92E+02	1.98E+03	2.35E+00	1.25E+00	1.53E+01	-1.52E+00	4.35E+02	1.32E+03
	MIN	1.87E+02	6.26E+02	1.78E+03	-2.53E+00	4.00E-01	-1.42E+01	-3.83E+00	3.78E+02	1.27E+03
299-W19-25	MAX	2.93E+02	3.09E+03	2.50E+03	1.07E+01	5.00E-01	1.66E+01	8.96E+00	2.79E+02	7.28E+02
	AVG	2.45E+02	1.95E+03	1.71E+03	2.60E+00	2.10E-01	-1.72E+00	2.31E+00	2.43E+02	6.21E+02
	MIN	1.82E+02	6.37E+02	1.47E+03	-3.05E+00	-7.00E-02	-6.99E+01	-3.57E+00	1.51E+02	1.49E+02
299-W19-26	MAX	1.66E+02	3.83E+02	1.51E+03	8.08E+00	6.40E-01	1.61E+01	3.97E+00	1.66E+02	1.20E+03
	AVG	1.30E+02	2.11E+02	1.38E+03	4.67E+00	1.70E-01	-1.66E+01	3.10E-01	1.23E+02	7.95E+02
	MIN	1.07E+02	8.67E+01	1.30E+03	1.14E+00	-3.90E-01	-7.09E+01	-2.41E+00	8.42E+01	6.21E+02

^a Maximum.^b Average.^c Minimum.

Table 21. Concentrations of Radiological Constituents and Nitrate for the Effluent and for Ground Water Near the 216-W-LWC Crib in 1987.

		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
Effluent										
Laundry (LNC)	AVG ^a	<9.97E+01	<2.82E+03	NN ^b	NAC	1.15E+02	NN	1.97E+02	NN	1.50E+00
Well										
299-W14-10	MAX ^d	7.30E+00	9.70E+00	2.41E+03	7.11E+00	3.90E-01	4.09E+01	4.00E+00	NN	1.03E+02
	AVG	4.10E+00	6.40E+00	1.48E+03	2.00E+00	1.20E-01	-2.21E+01	-1.61E+00		8.93E+01
	MIN ^e	1.30E+00	4.70E+00	2.48E+02	-5.60E+00	1.00E-02	-7.85E+01	-9.00E+00		6.42E+01

^a Average.

^b Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).

^c Not available.

^d Maximum.

^e Minimum.

Table 22. Concentrations of Radiological Constituents and Nitrate for the Effluent and for Ground Water Near the 216-Z-20 Crib in 1987.

		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
Effluent										
234-5 Z (2904-AZ)	AVG ^a	3.31E+01	<2.11E+01	NN ^b	NA ^c	<1.57E+01	NN	<3.68E+01	NN	9.70E-01
231-Z (231-Z)										
Well										
299-W18-17	MAX ^d	1.40E+00	6.10E+00	7.63E+02	7.02E+00	NN	6.12E+01	2.86E+00	NN	8.03E+00
	AVG	3.00E-01	4.10E+00	3.44E+02	1.69E+00		1.74E+01	-6.00E-02		5.58E+00
	MIN ^e	-2.00E-01	2.30E+00	8.70E+01	-6.31E+00		-2.16E+01	-2.99E+00		2.50E+00
299-W18-18	MAX	1.40E+00	4.40E+00	2.33E+02	6.43E+00	NN	4.37E+01	2.14E+00	NN	3.01E+00
	AVG	6.00E-01	3.10E+00	7.77E+01	2.00E+00		2.00E+00	2.90E-01		1.06E+00
	MIN	0.00E+00	2.50E+00	-7.89E+01	-6.07E+00		-7.21E+01	-2.65E+00		5.00E-01
299-W18-20	MAX	2.30E+00	6.10E+00	1.69E+03	2.14E+00	NN	3.35E+01	9.33E+00	NN	3.88E+00
	AVG	1.00E+00	4.70E+00	5.40E+02	-4.24E+00		-9.43E+00	3.70E-01		3.01E+00
	MIN	4.00E-01	3.70E+00	1.29E+01	-1.09E+01		-6.53E+01	-1.62E+01		2.50E+00

^a Average.^b Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).^c Not available.^d Maximum.^e Minimum.

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4.0 SEPARATIONS AREA WATER- DISPOSAL SUMMARY

Water for processing, sanitary use, and power generation is obtained from the Columbia River and pumped to treatment and storage facilities in the 200 East and 200 West Areas.

Summaries of water disposal in each area are provided in Tables 23 and 24. These tables also indicate the disposal facility for each waste stream. Sanitary water is disposed of to ground via septic tank drainage systems near the plant buildings. Water-disposal data were obtained from facility processing records and estimates and from powerhouse records.

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Table 23. Water-Disposal Summary for 200 East Area During CY 1987.

Effluent stream	Disposal Facility No.	Volume	
		(gal)	(L)
202-A process condensate (PDD)	216-A-10 216-A-45	1.71 E + 06 1.18 E + 07	6.47 E + 06 4.48 E + 07
202-A steam condensate (SCD)	216-A-30 216-A-37-2	1.05 E + 08 5.17 E + 07	3.97 E + 08 1.96 E + 08
202-A ammonia scrubber waste (ASD)	216-A-36B	7.41 E + 06	2.81 E + 07
242-A process condensate (AFPC)	216-A-37-1	6.46 E + 06	2.45 E + 07
241-AZ, AZ Tank Farm coil condensate (A08)	216-A-8	No discharge	No discharge
PUREX chemical sewer (CSL)	216-B-3	2.23 E + 08	8.45 E + 08
PUREX cooling water (CWL) 242-A cooling water (ACW) 242-A steam condensate (ASC) 244-AR Vault cooling water (CAR) 241-A Tank Farm cooling water (CA8) B Plant cooling water (CBC) Powerhouse water (B3 SUM)	216-B-3 216-A-25	5.65 E + 09	2.14 E + 10
B Plant chemical sewer (BCE)	216-B-63	9.26 E + 07	3.51 E + 08
B Plant steam condensate (BCS)	216-B-55	No discharge	No discharge
B Plant process condensate (BCP)	216-B-62	No discharge	No discharge
Water Treatment Facility	216-A-25 216-B-3	9.10 E + 07	3.45 E + 08
Powerhouse ash sluice Baghouse cleaning	Ash Pit	8.10 E + 06	3.07 E + 07
Sanitary water	Misc. Tile Fields	2.40 E + 07	9.10 E + 07
Total Water Disposed of in 200 East Area in 1987		6.28 E + 09	2.38 E + 10

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Table 24. Water-Disposal Summary for 200 West Area During CY 1987.

Effluent stream	Disposal Facility No.	Volume	
		(gal)	(L)
Redox chemical sewer (S-10)	216-S-10	5.22 E + 07	1.98 E + 08
222-S laboratory pond (207-SL)	216-S-26	9.08 E + 06	3.44 E + 07
242-S process condensate (RC3) (Ion Exchange Column)	216-S-25	No discharge	No discharge
UO ₃ Plant process condensate (U-12)	216-U-12	1.69 E + 05	6.40 E + 05
242-S steam condensate (RC1)	216-U-14	3.88 E + 06	1.47 E + 07
UO ₃ Plant steam condensate and cooling water (207-U)	216-U-14	9.05 E + 07	3.43 E + 08
231-Z cooling water (231-Z) 234-5Z liquid waste (2904-ZA)	216-Z-20	6.57 E + 07	2.49 E + 08
Laundry (LWC)	216-W-LWC	1.60 E + 07	6.07 E + 07
Powerhouse and Water Treatment Facility	Powerhouse Pond	1.52 E + 07	2.85 E + 08
Powerhouse ash sluice Baghouse cleaning	Ash Pit	8.10 E + 06	3.07 E + 07
Sanitary water	Misc. Tile Fields	2.47 E + 07	9.36 E + 07
T Plant drain flush and headend wastes	216-T-1	6.12 E + 04	2.32 E + 05
221-T cold chemical drain and compressor	216-T-4-2	5.07 E + 06	1.92 E + 07
Total Water Disposed of in 200 West Area in 1987		3.51 E + 08	1.33 E + 09

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5.0 INACTIVE DISPOSAL SITES

Liquid waste disposal sites that no longer receive wastes are monitored for changes that would indicate a potential problem. While no concentration guidelines exist for inactive sites, concentrations of ground-water samples are compared with the DCG and ACL for reference purposes. In last year's report (Law et al. 1987), five inactive sites that yielded samples exceeding guidelines were discussed: the 216-B-5 reverse well (^{90}Sr and ^{137}Cs), the 216-S-1/2 Cribs (^{90}Sr), the 216-U-1/2 Cribs (uranium), the 216-U-10 Pond (uranium), and the 216-U-16 Crib (uranium). Wells at the 216-S-1/2 Cribs and the 216-U-16 Crib are now below guidelines, so those sites will not be discussed. Recent uranium increases in the well monitoring the inactive 216-U-8 Crib are responsible for including the facility in the discussion this year. The extent to which the uranium contaminations beneath 200 West Area facilities are related is not well known. Discovery of uranium beneath the unused 216-U-17 Crib reaffirmed the importance of a study to investigate the uranium ground-water plume in 200 West Area, which is planned for FY 1989.

Monitoring results for wells near other inactive liquid disposal sites are reported in Appendix B.1.

5.1 INACTIVE 216-B-5 REVERSE WELL

A reverse well at the Hanford Site is a well that received liquid waste for disposal to ground. The 216-B-5 Reverse Well discharged waste containing ^{90}Sr , ^{137}Cs and plutonium to the water table from 1945 to 1947. This reverse well is located northeast of the 221-B Building in 200 East Area (see Figure 10 and Figure A-12), and received waste from this building.

A characterization study (Smith 1980) determined that contamination in the sediments near the water table has remained within 40 ft (12 m) of the reverse well. Results from four closely spaced monitoring wells (Table 25) indicate that contamination of the ground water

is also very localized. Three of the wells, 299-E28-07, 299-E28-24 and 299-E28-25, were added to the previously used well, 299-E28-23, to enhance ground-water monitoring of 216-B-5 well in 1987. In well 299-E28-23, located several feet from the reverse well, average concentrations of ^{90}Sr and ^{137}Cs are the highest of the four wells, with ^{90}Sr exceeding both the DCG and ACL and ^{137}Cs exceeding the ACL. However, levels of these contaminants have been declining over the past 3 yr in this well. The ^{90}Sr ACL is exceeded in the other three wells but both ^{90}Sr and ^{137}Cs decrease rapidly with distance from the reverse well. Sampling for plutonium is conducted in all four wells but the results are all below the DCG and ACL (see Appendix B.3).

5.2 INACTIVE 216-U-1/2 CRIBS

The 216-U-1/2 Cribs are located southwest of the 221-U Building in the south-central part of the 200 West Area (see Figure 11). These cribs received waste from the 221-U and 224-U Buildings from 1952 to 1967.

In early 1985, uranium concentrations in one of the monitoring wells were discovered to have increased abruptly to 72,000 pCi/L. Subsequent investigation revealed that the contamination resulted from the combination of past use of this crib and the activation in 1984 of the 216-U-16 Crib. Remedial action consisted of grout sealing of three wells and pumping of ground water to remove uranium through an ion exchange process. Four additional monitoring wells were also constructed. The details of these activities were discussed in Law and Schatz (1986) and Delegard et al. (1986).

The cribs are now monitored by seven wells (see Figure A-18). A list of these wells and a summary of 1987 monitoring are provided in Table 26. Except in wells 299-W19-15 and 299-W19-17, uranium concentrations exceed the DCG and ACL, but other radionuclides are below both of these guidelines. Ground-water transport modeling indicates that the concentration of uranium is expected to be below the DCG when it reaches the Columbia River. Isotopic uranium results for 1987 are listed in

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Table 25. Concentrations of Radiological Constituents and Nitrate in Ground Water Near the Inactive 216-B-5 Reverse Well in 1987.

Well no.		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-E28-07	MAX ^a	1.60E+00	2.96E+02	NN ^d	6.79E+00	1.45E+02	8.83E+00	3.20E+00	1.29E+00	NN
	AVG ^b	1.10E+00	1.92E+02		1.50E+00	9.40E+01	-4.40E+01	-1.73E+00	1.15E+00	
	MIN ^c	8.00E-01	1.12E+02		-3.64E+00	6.93E+01	-9.22E+01	-7.67E+00	1.02E+00	
299-E28-23	MAX	5.72E+01	1.57E+04	7.43E+03	6.94E+01	7.80E+03	6.11E+01	2.49E+03	3.50E+01	1.14E+01
	AVG	3.30E+01	1.24E+04	6.29E+03	1.68E+01	6.10E+03	-5.35E+01	1.88E+03	2.64E+01	1.02E+01
	MIN	1.18E+01	1.01E+04	5.53E+03	-2.44E+00	4.04E+03	-3.12E+02	1.58E+03	2.32E+01	9.27E+00
299-E28-24	MAX	6.00E-01	3.81E+02	NN	1.22E+01	1.92E+02	2.24E+01	9.65E+00	4.75E-01	NN
	AVG	3.00E-01	2.99E+02		6.30E-01	1.89E+02	1.07E+01	4.53E+00	2.72E-01	
	MIN	2.00E-01	2.01E+02		-1.13E+01	1.86E+02	2.79E+00	-3.00E+00	1.36E-01	
299-E28-25	MAX	9.00E+00	8.83E+03	NN	6.73E+00	3.49E+03	3.52E+01	4.75E+01	4.96E+00	NN
	AVG	6.90E+00	6.10E+03		2.60E+00	3.15E+03	-2.50E+01	3.61E+01	3.67E+00	
	MIN	3.40E+00	4.37E+03		-5.46E+00	2.73E+03	-1.03E+02	1.90E+01	2.44E+00	

^a Maximum.^b Average.^c Minimum.^d Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).

Table 26. Concentrations of Radiological Constituents and Nitrate in Ground Water Near the Inactive 216-U-1/2 Cribs in 1987.

Well no.		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-W19-03	MAX ^a	1.05E+04	1.01E+04	1.99E+03	2.88E+01	6.34E+00	4.23E+01	8.12E+00	1.13E+04	1.13E+02
	AVG ^b	7.29E+03	6.86E+03	1.41E+03	2.82E+00	2.80E+00	1.44E+00	4.60E-01	7.40E+03	9.96E+01
	MIN ^c	3.93E+03	4.05E+03	9.21E+02	-1.52E+01	3.90E-01	-2.18E+01	-5.23E+00	3.99E+03	7.14E+01
299-W19-09	MAX	4.26E+03	5.06E+03	NN ^d	NN	NN	NN	NN	6.50E+03	1.26E+02
	AVG	2.81E+03	3.28E+03						3.38E+03	8.44E+01
	MIN	1.56E+03	1.83E+03						1.54E+03	1.39E+01
299-W19-11	MAX	5.24E+03	6.97E+03	1.71E+03	7.78E+00	2.79E+00	6.48E+01	3.58E+00	6.43E+03	1.41E+02
	AVG	4.03E+03	4.98E+03	1.12E+03	2.44E+00	1.67E+00	3.65E+00	-4.60E-01	4.56E+03	1.17E+02
	MIN	2.86E+03	3.27E+03	2.82E+02	-3.85E+00	8.00E-02	-7.76E+01	-1.15E+01	3.04E+03	1.02E+02
299-W19-15	MAX	6.52E+02	8.17E+02	NN	NN	NN	NN	NN	5.42E+02	1.26E+02
	AVG	2.22E+02	4.18E+02						2.61E+02	7.77E+01
	MIN	5.81E+01	8.19E+01						1.30E+02	2.17E+00
299-W19-16	MAX	1.79E+03	2.68E+03	NN	NN	NN	NN	NN	1.75E+03	9.71E+01
	AVG	1.38E+03	1.89E+03						1.37E+03	5.49E+01
	MIN	1.02E+03	1.42E+03						1.04E+03	3.52E+01
299-W19-17	MAX	5.37E+01	8.21E+01	NN	NN	NN	NN	NN	4.11E+01	5.52E+01
	AVG	2.19E+01	6.01E+01						3.29E+01	1.51E+01
	MIN	8.30E+00	4.27E+01						2.13E+01	1.04E+01
299-W19-18	MAX	5.09E+03	9.29E+03	NN	NN	NN	NN	NN	6.55E+03	3.03E+02
	AVG	4.48E+03	7.94E+03						5.04E+03	2.37E+02
	MIN	3.62E+03	6.29E+03						4.18E+03	1.67E+02

^a Maximum.^b Average.^c Minimum.^d Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).

Appendix B.3. Figure 20 illustrates the decline in uranium concentrations in well 299-W19-11 as a result of the pumping and treatment action. This well had the highest initial uranium concentration, and it was also close to the pumped well and exhibited a maximum response to pumping. The other monitoring wells are showing a similar decline in uranium concentration.

5.3 INACTIVE 216-U-8 CRIB

The 216-U-8 crib received process condensate from UO₃ Plant operations between 1952 and 1960. The facility is located south of 221-U Plant in the south-central part of 200 West Area (see Figure 11). During its 8-yr lifetime the crib received approximately 24,000 kg of uranium. In 1960, the crib was removed from service and the waste stream was routed to the 216-U-12 Crib (see Section 3.2.11).

The well 299-W19-02 monitors the site (Figure A-19). Table 27 lists the average concentrations of constituents monitored in the well during 1987. Radionuclide levels had remained stable and below guidelines until the beginning of 1987, when uranium and total beta

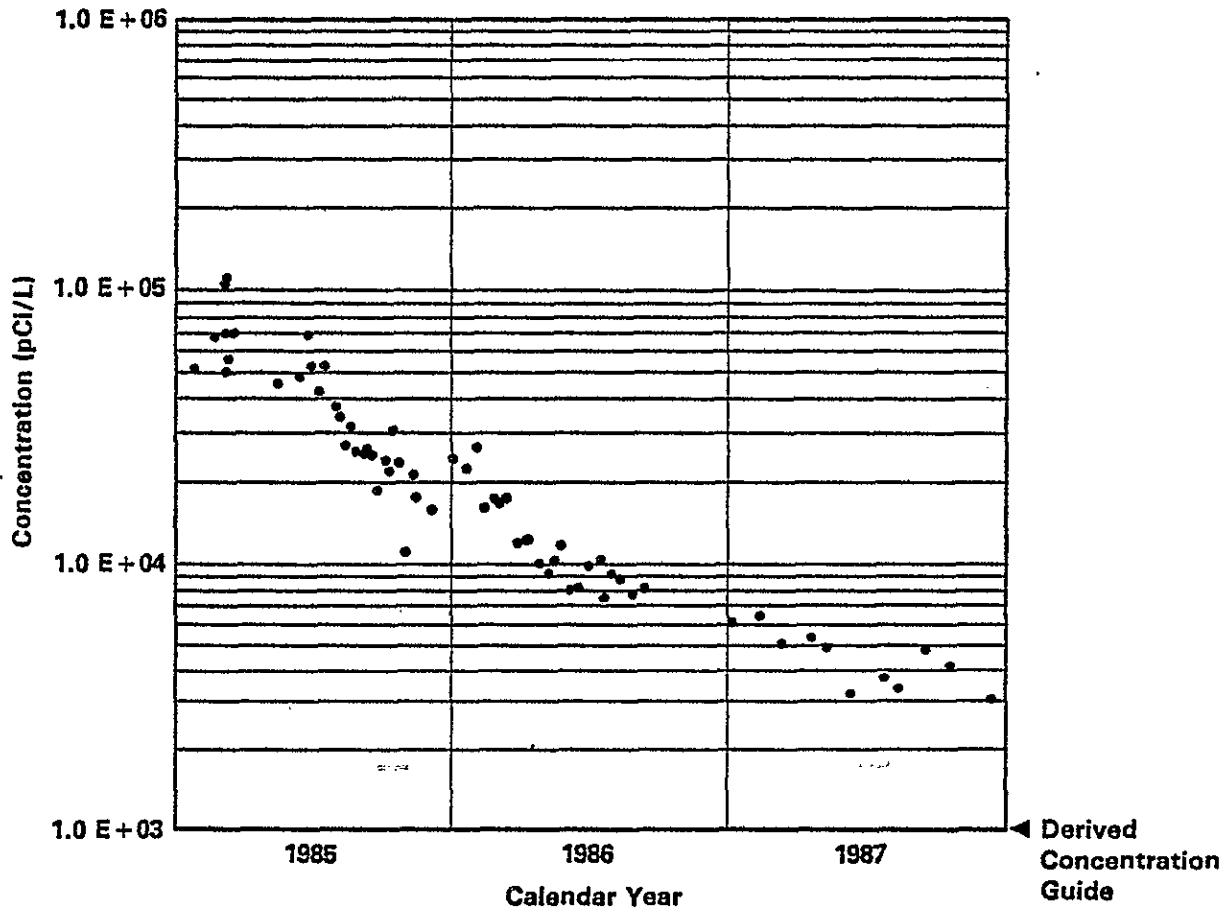
readings began to increase. Nitrate levels were already trending upward in 1986. By the end of 1987, the average uranium concentration exceeded the derived total uranium ACL, but remained below the DCG (see Figure 21). Sampling from this well will be conducted monthly rather than quarterly.

5.4 INACTIVE 216-U-10 POND (U POND)

The 216-U-10 Pond was deactivated in December 1984, after 40 yr of operation. The pond, located in the southwest corner of 200 West Area (see Figure 11), was removed from service to eliminate the driving force acting on the contaminated sediments of the pond bottom and as a water conservation measure.

The 1987 ground-water monitoring results for the three monitoring wells 299-W18-15, 299-W23-11, and 699-35-78A (see Figure A-20) are summarized in Table 28. Average concentrations of radionuclide constituents are below the DCG and the ACL with the exception of uranium at well 299-W18-15, which is above the derived total uranium ACL of 40 pCi/L. Uranium concentrations in the three wells have remained unchanged for the past 3 yr.

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Figure 20. Uranium Concentration History for Well 299-W19-11 at the 216-U-1/2 Crib.

9 2 1 2 5 0 0 0 8 3 7

Table 27. Concentrations of Radiological Constituents and Nitrate in Ground Water Near the Inactive 216-U-8 Crib in 1987.

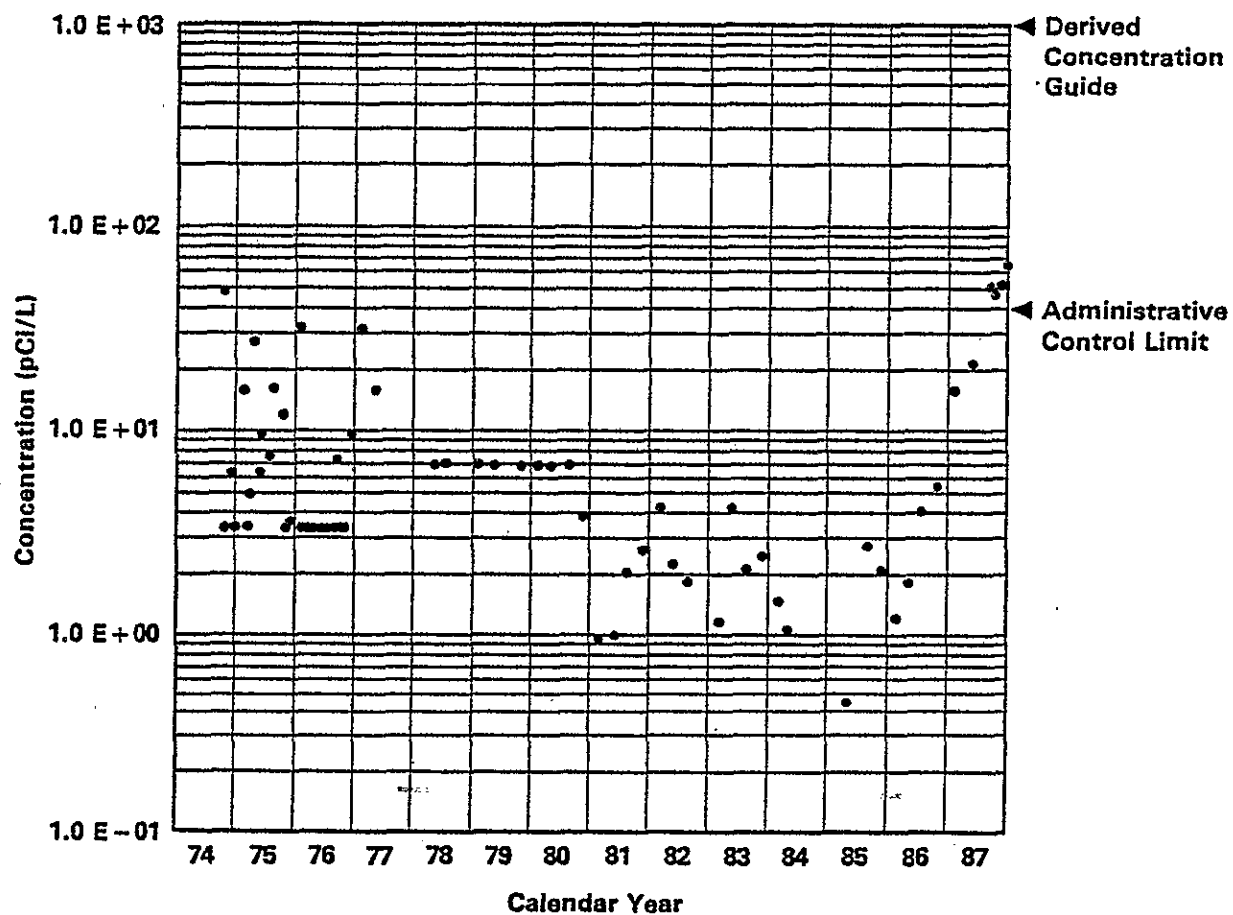
Well no.		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-W19-02	MAX ^a	9.14E+01	1.28E+02	1.29E+05	2.29E+00	1.74E+01	2.91E+00	5.98E+00	6.42E+01	5.85E+02
	AVG ^b	5.34E+01	9.72E+01	1.08E+05	-2.03E+00	1.38E+01	-4.22E+01	7.30E-01	4.16E+01	4.60E+02
	MIN ^c	1.69E+01	6.98E+01	6.99E+04	-7.02E+00	1.06E+01	-9.42E+01	-8.26E+00	1.58E+01	3.17E+02

^a Maximum.

^b Average.

^c Minimum.

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Figure 21. Uranium Concentration History for Well 299-W19-02 at the 216-U-8 Crib.

Table 28. Concentrations of Radiological Constituents and Nitrate in Ground Water Near the Inactive 216-U-10 Pond in 1987.

Well no.		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-W18-15	MAX ^a	8.03E+01	2.93E+01	3.35E+02	3.21E+00	NN ^d	5.06E+01	2.33E+00	5.19E+01	2.78E+00
	AVG ^b	5.30E+01	1.75E+01	1.41E+02	-1.27E+00		-1.57E+00	1.10E-01	4.61E+01	1.87E+00
	MIN ^c	4.12E+01	1.00E+01	-4.86E+01	-4.57E+00		-2.30E+01	-2.33E+00	3.99E+01	5.41E-01
299-W23-11	MAX	4.26E+01	1.99E+01	8.51E+04	1.41E+00	NN	4.80E+01	1.71E+00	2.15E+01	2.75E+00
	AVG	2.16E+01	1.11E+01	2.12E+04	-3.30E+00		-3.28E+01	-3.80E-01	1.59E+01	2.55E+00
	MIN	1.79E+01	7.00E+00	1.00E+03	-1.01E+01		-1.15E+02	-2.57E+00	1.26E+01	2.50E+00
699-35-78A	MAX	1.37E+01	1.01E+01	3.19E+02	5.63E+00	NN	-7.33E+00	9.66E+00	1.32E+01	2.50E+00
	AVG	9.40E+00	6.50E+00	8.23E+01	3.08E+00		-3.43E+01	5.06E+00	7.81E+00	1.83E+00
	MIN	4.70E+00	4.40E+00	-1.68E+02	1.61E+00		-5.93E+01	0.00E+00	5.36E+00	5.00E-01

^a Maximum.^b Average.^c Minimum.^d Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).

6.0 CONCENTRATION PLUME MAPS

Isopleth maps have been prepared to illustrate the spatial distribution of the average concentration of several ground-water constituents in relation to processing facilities in the Separations Area. Maps showing the total beta, tritium, and nitrate plumes in the Separations Area were prepared by Westinghouse Hanford, while Hanford Site tritium and nitrate plume maps were prepared by PNL (PNL 1988). Data collected for Westinghouse Hanford and PNL were used in constructing all of the maps.

Plume maps were prepared for average concentrations of tritium and nitrate because the high mobilities associated with these constituents indicate the maximum extent of contaminant migration. A map of the extent of total beta contamination has been prepared for the Separations Area only. The total beta concentration has decayed downgradient from the Separations Area; thus, a Hanford Site map was not appropriate.

6.1 TOTAL BETA

Beta radiation measured in ground-water samples is primarily attributed to the presence of ^{90}Sr , ^{99}Tc , and uranium daughter products. The total beta map for the Separations Area (Figure 22) shows the 10-, 100-, 1,000-, and 10,000-pCi/L isopleths. Except for the 216-A Cribs near PUREX, higher concentrations of total beta are associated with past disposal to now inactive facilities. Total beta contamination around Gable Mountain Pond, deactivated in 1987, is the result of a ^{90}Sr spill in 1964 (see Section 3.1.1). At the inactive 216-B-5 Reverse Well in 200 East Area, ^{90}Sr is also responsible for total beta readings in excess of 10,000 pCi/L (see Section 5.1). The plume emanating from the inactive 216-BY Cribs in the northern part of 200 East Area is due to ^{99}Tc contamination. In the southern part of 200 West Area, ^{99}Tc and ^{90}Sr are the causes of plumes issuing from the 216-S Cribs. Beta-emitting decay daughters of uranium are responsible for

the plume originating from the 216-U-1/2 Cribs in 200 West Area.

The total beta plume map for 1987 differs somewhat from the 1986 version (Law et al. 1987) due to an increase in the number of data points and the addition of the 10-pCi/L isopleth. However, concentrations of total beta have not changed significantly.

6.2 TRITIUM

Maps depicting tritium concentrations in the Separations Area and the Hanford Site are shown in Figures 23 and 24, respectively. Tritium isopleths for 5,000, 20,000, 200,000, and 2,000,000 pCi/L are shown in these figures. The 2,000,000-pCi/L isopleth is equal to the DCG.

The tritium plume map for the Separations Area (see Figure 23) shows tritium from five sources: the inactive 216-S and 216-T Crib areas in 200 West Area; the active 216-A and 216-B-55 Cribs in 200 East Area; and B-Pond. Tritium levels in excess of 5,000 pCi/L are also observed at Gable Gap (between Gable Mountain and Gable Butte) north of 200 East Area. Although northward ground-water flow occurs through Gable Gap, there are insufficient data to determine whether or not this plume is a continuation of the tritium plume beneath the northwest corner of 200 East Area.

In 200 West Area, the plume from the 216-S Crib area is moving eastward and the plume from the 216-T Crib area is moving northward, both of which are caused by radial flow from the ground-water mound beneath the deactivated U-Pond (see Figure 2). The large plume from the southeast corner of 200 West Area results from past operations in 200 West Area. Elevated tritium concentrations in the southeast corner of 200 East Area, around the 216-A Crib area south of PUREX, reflect recent operations and exhibit a slightly larger area in 1987 over 1986. Figure 24 reveals that the tritium plume in the southeast corner of the 200 East Area extends southeasterly in a continuous manner toward the Columbia River. The tritium plume from prior operations in 200 East Area has moved eastward and divided into two lobes: one moving

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Total Beta Plumes Within the Separations Area 1987 Data

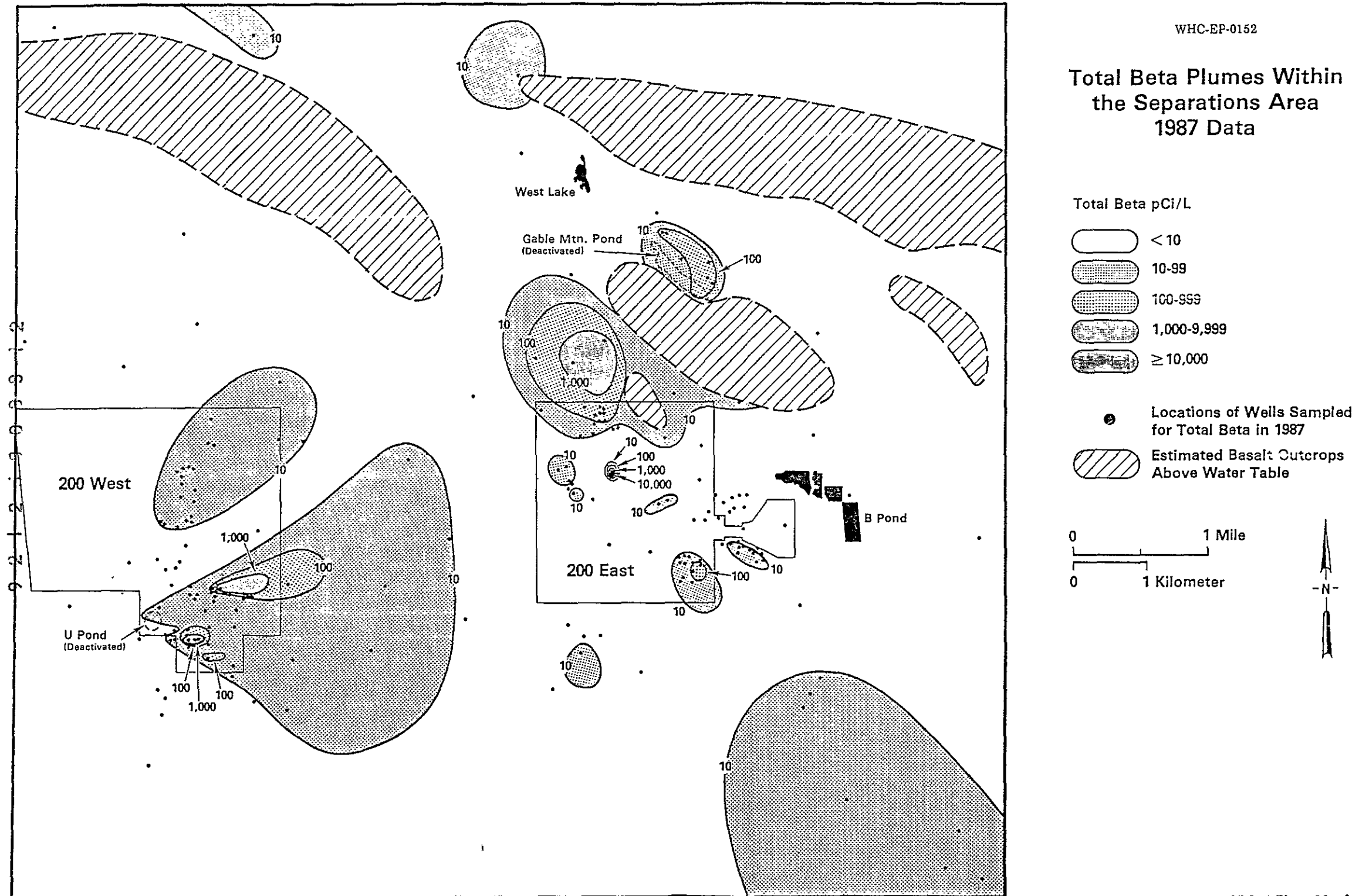
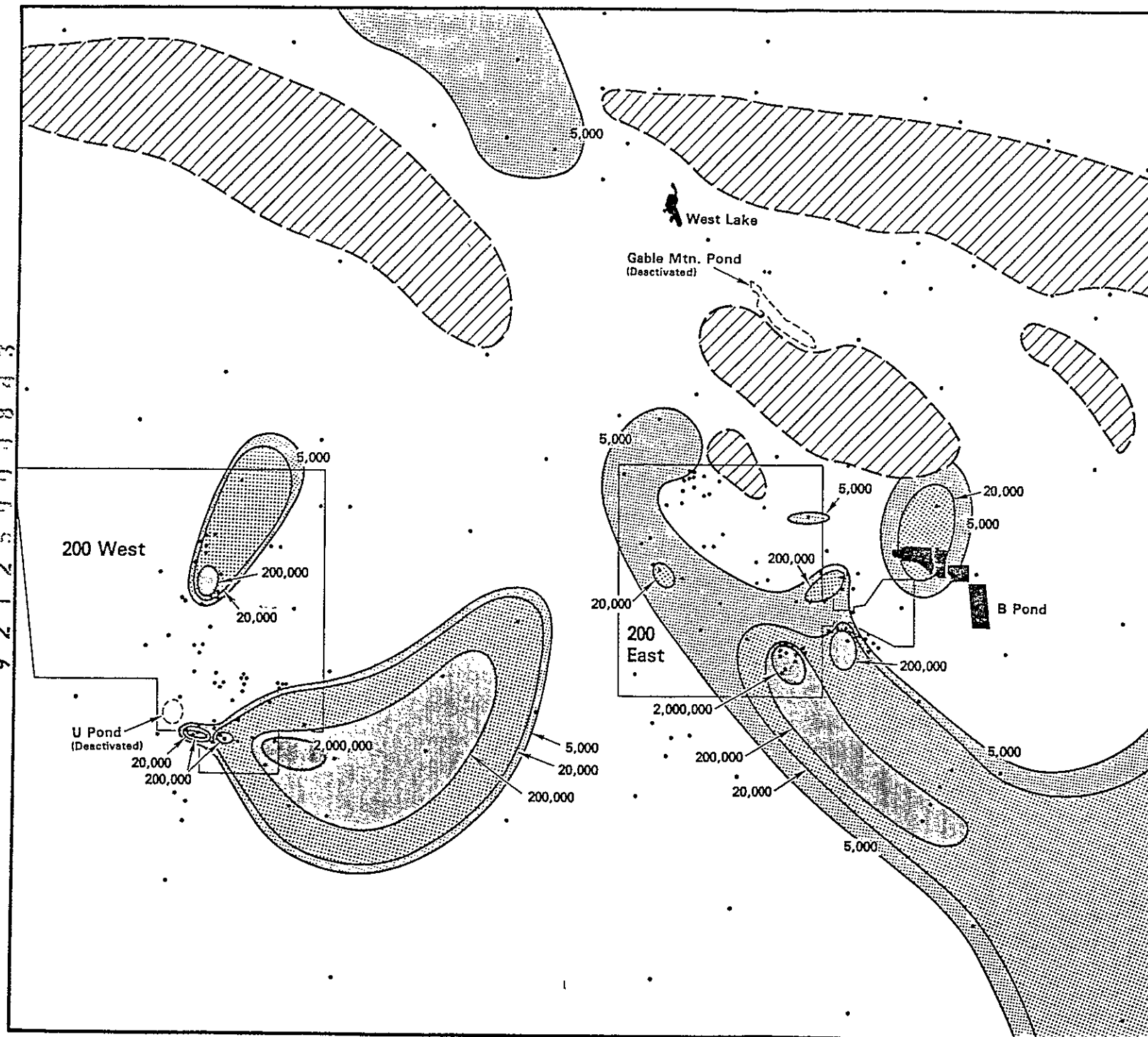


Figure 22. Total BETA Plume Map for the Separations Area, 1987,

Tritium Plumes Within the Separations Area 1987 Data

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Tritium pCi/L

< 5,000

5,000-19,000

20,000-199,000

200,000-1,999,000

 $\geq 2,000,000$

● Locations of Wells Sampled
for Tritium in 1987

Estimated Basalt Outcrops
Above Water Table

0 1 Mile
0 1 Kilometer

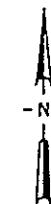


Figure 23. Tritium Plume Map for the
Separations Area, 1987.

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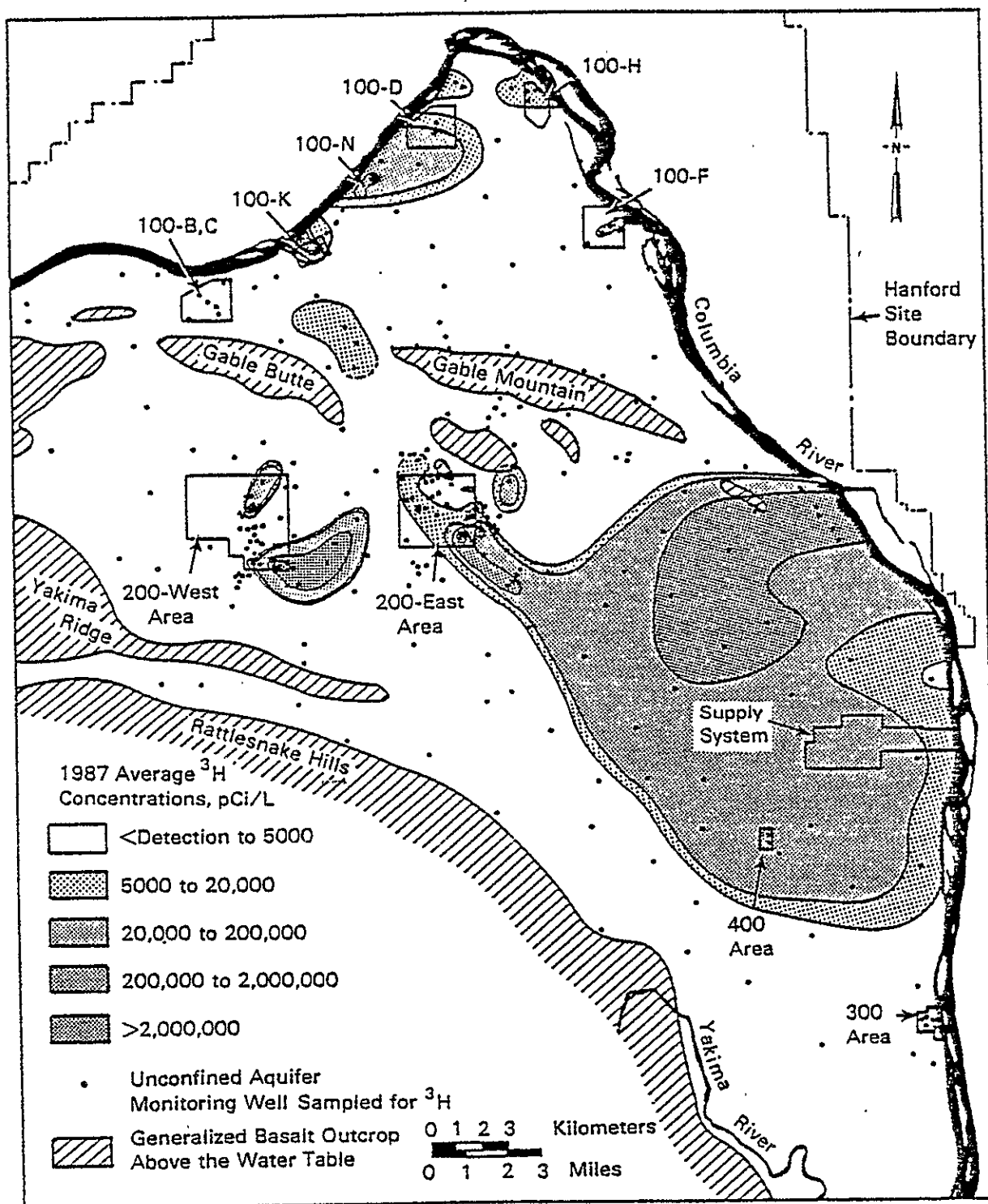


Figure 24. Tritium Plume Map for the Hanford Site, 1987 (PNL 1988).

eastward to the Columbia River and the other moving southeastward toward the 400 Area (see Figure 24).

6.3 NITRATE

Figure 25 shows the nitrate plumes in the Separations Area. Nitrate (reported as nitrate) isopleths have been constructed for 20 and 45 ppm. The greatest concentrations of nitrate in 200 East Area surround the 216-A Cribs, 216-B-62 Crib, and the 216-BY Cribs. In 200 West Area, the highest concentrations result from disposal to the 216-T Cribs, 216-Z Cribs, 216-S-25 Crib, 216-U-1/2 Cribs, and 216-W-LWC Crib. The nitrate plumes from 200 West Area flow eastward toward 200 East Area. In 200 East Area, the nitrate plumes exit the Separations Area to the northwest, through

Gable Gap, and also to the southeast. This general flow pattern of the nitrate plume from the 200 Areas conforms to the general tritium plume flow pattern. The nitrate isopleths in 200 East and 200 West Areas in 1987 are somewhat different than those plotted in 1986 (Law et al. 1987) due to the elimination of some anomalously low values, the addition of new wells, the elimination of the 5 and 10 ppm isopleths, and minor changes in interpretation.

Nitrate concentrations for the Hanford Site are shown in Figure 26. Concentrations of nitrate exceeding 45 ppm (equivalent to the drinking water standard) southeast from the 200 East Area are the result of past operations in 200 East Area. Nitrate is also generated by past and present operations at the 100 and 300 Areas.

Nitrate Plumes Within the Separations Area 1987 Data

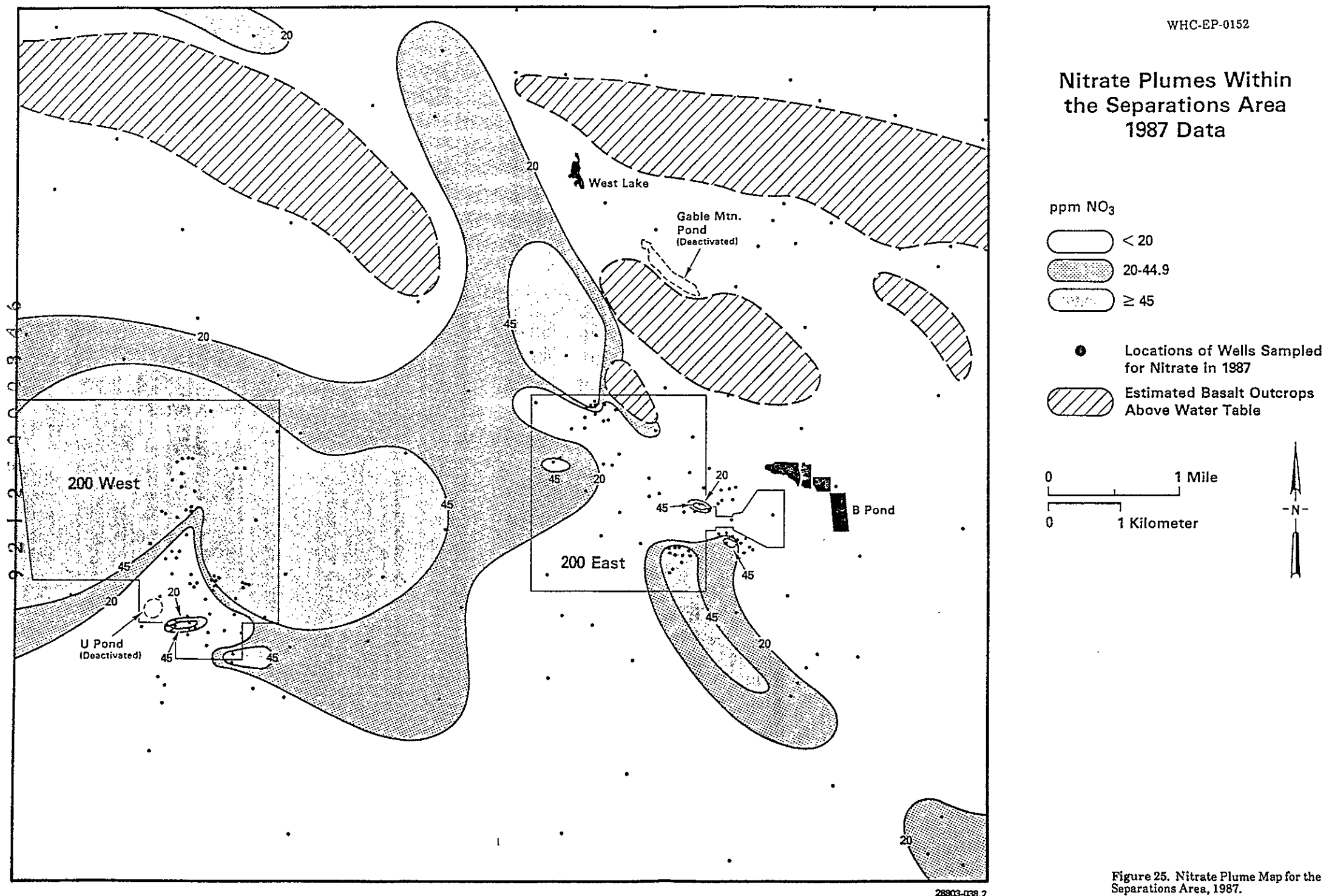


Figure 25. Nitrate Plume Map for the Separations Area, 1987.

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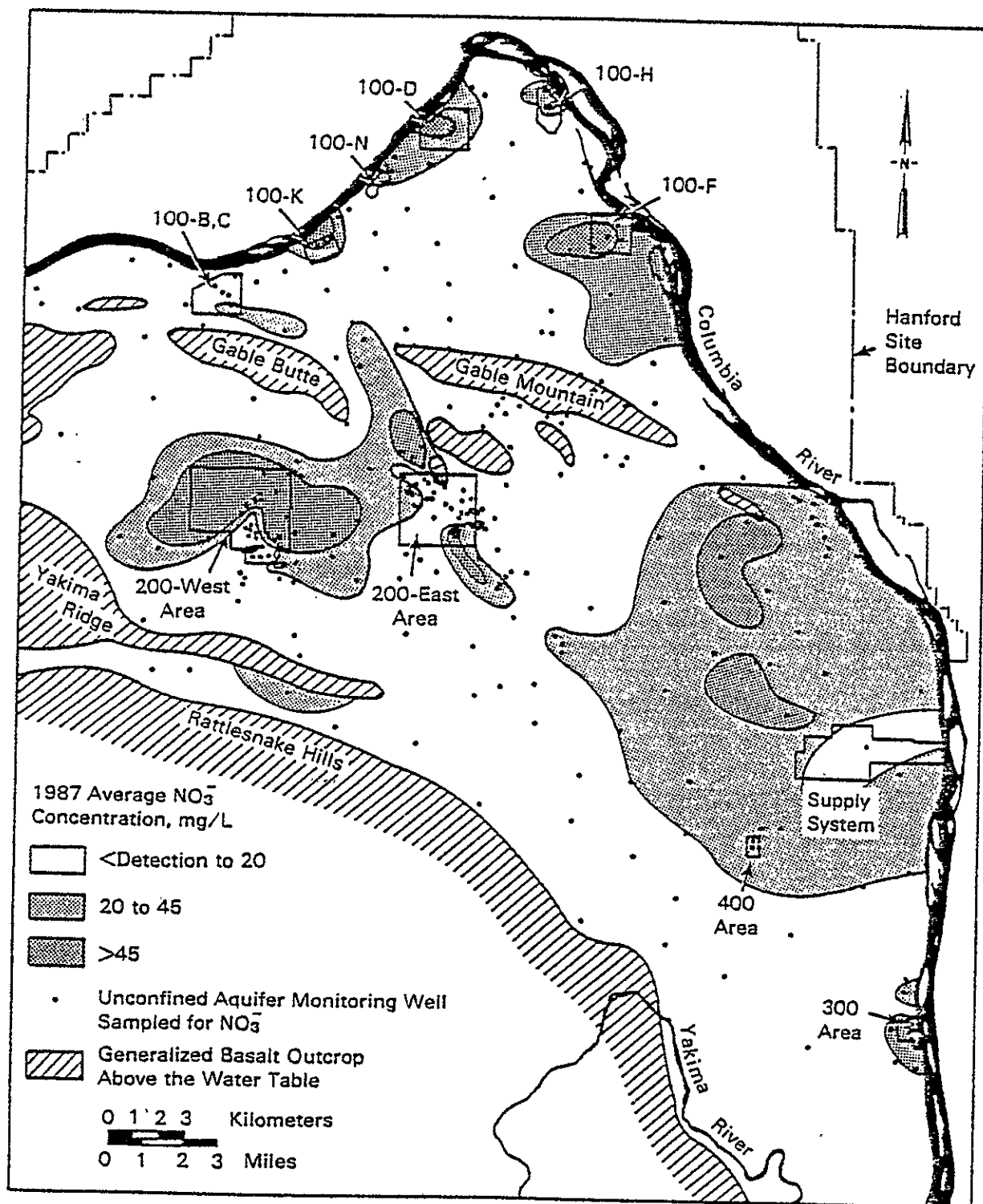


Figure 26. Nitrate Plume Map for the Hanford Site, 1987 (PNL 1988).

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7.0 SPECIAL GROUND-WATER SAMPLE ANALYSES

Special sampling for ^{99}Tc and ^{129}I analyses was continued in 1987. The ^{129}I analyses were conducted to monitor the cribs associated with the operation of PUREX and to monitor elevated ^{129}I concentrations associated with past operations. The ^{129}I samples were collected from six wells at three active and one inactive PUREX cribs and at a well downgradient from 200 West Area. The ^{99}Tc analyses were run on samples collected from a number of wells in the Separations Area where elevated total beta readings are not explained by the presence of ^{90}Sr or uranium.

7.1 IODINE (^{129}I)

The results of special sampling for ^{129}I are listed in Table 29. Note that in 1987, ^{129}I analyses were performed by U.S. Testing rather than by PNL as in the past. The changes observed in the 1987 values may result from the implementation of the U.S. Testing procedure, which is not as sensitive as the PNL method.

Comparing the new readings with average values from previous years, only the result from well 299-E17-01, at the now inactive 216-A-10 Crib, is significantly higher. At this well, the 1987 value of 47 pCi/L is twice the average of 11 previous results dating back to 1984. In well 299-E17-09, at the 216-A-36B crib, the latest value of 27 pCi/L is similar to the average from previous years and slightly lower than last year's reading of 32 pCi/L. Both of these wells exceed the ACL for ^{129}I of 20 pCi/L, though remain below the DCG. Readings below the ACL are observed in wells 299-E17-06, which is several hundred feet (100 m) south of 216-A-36B Crib, and in well 299-E17-02, located at the

inactive 216-A-27 Crib north of the 216-A-36B Crib. Initial readings in both wells at the new 216-A-45 Crib are elevated though below the ACL. The well downgradient from 200 West Area, 699-35-70 (see Figure A-2 in Appendix A for well location), continues to exceed the ACL, although the 1987 value of 47 pCi/L is lower than the average of three previous results, which is 75 pCi/L. The ^{129}I in this well is from prior processing operations in 200 West Area.

7.2 TECHNETIUM (^{99}Tc)

The results for the ^{99}Tc analyses performed in 1987 are listed in Table 30. All of the results are below the DCG, although wells at several inactive sites exceed the ACL of 4000 pCi/L. The wells exceeding the ACL are 299-E33-07, at the 216-B-48/49/50 Cribs, 299-W19-18, at the 216-U-1/2 Cribs, and 299-W19-20, 299-W19-24, and 299-W19-25, at the 216-U-17 Crib, which had not yet received effluent in 1987 and for which a baseline is being determined (see Section 3.2.12).

The ^{99}Tc values are expected to be about five times as high as the corresponding total beta values if ^{99}Tc is the primary cause of elevated total beta readings in the wells surveyed. This is due to the relative weakness of beta emissions by ^{99}Tc as compared with ^{90}Sr , which is the calibration standard chosen by Westinghouse Hanford for total beta analyses. With the exception of the 216-U-1/2 and 216-U-17 Crib sites, most of the ^{99}Tc values are at the levels which indicate that ^{99}Tc is the primary beta emitter. At the 216-U-1/2 Cribs, total beta readings are higher than can be accounted for by ^{99}Tc alone because uranium daughter products contribute significantly to the beta radioactivity. At the 216-U-17 Crib, ^{99}Tc results are higher than predicted by total beta, the cause of which has not been determined.

Table 29. Results of ^{129}I Analyses of Ground Water Samples in 1987.

Waste site	Well number	Sample date	^{129}I (pCi/L) ^a
216-A-10 Crib (deactivated 1987)	299-E17-01	08/10/87	47.3
216-A-27 Crib (inactive)	299-E17-02	11/10/87	1.33
216-A-36B Crib (deactivated 1987)	299-E17-06	12/02/87	4.73
	299-E17-09	08/10/87	27
216-A-45 Crib	299-E17-12	12/02/87	7.29
	299-E17-13	12/02/87	10.1
200 West Area	699-35-70	07/09/87	47.2

^aDetection limit is 15 pCi/L.

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Table 30. Results of ^{99}Tc Analyses of Ground Water Samples in 1987.

Waste site	Well number	Sample date	^{99}Tc (pCi/L)
216-A Cribs	299-E17-01	08/10/87	34.2
	299-E17-02	09/02/87	114
	299-E17-05	08/10/87	226
		10/07/87	411
216-B Cribs	299-E33-01	08/04/87	964
	299-E33-03	08/06/87	1,400
	299-E33-05	08/10/87	1,980
	299-E33-07	08/04/87	4,700
	299-E33-08	08/04/87	192
	299-E33-09	09/02/87	592
	299-E33-24	08/06/87	1,580
	299-E33-26	09/01/87	1,420
216-T Cribs and 241-T Tank Farm	299-W10-03	09/22/87	610
	299-W10-04	07/22/87	277
	299-W10-08	08/19/87	1.39
	299-W11-11	09/18/87	385
	299-W11-18	09/18/87	510
	299-W11-23	09/18/87	270
	299-W11-24	09/18/87	25
216-U Cribs	299-W19-02	05/17/87	289
		09/17/87	581
	299-W19-03	06/10/87	2,590
		08/13/87	2,260
		09/15/87	2,330
		12/09/87	1,860
		12/09/87	1,120
	299-W19-09	06/10/87	3,200
		09/15/87	2,320
		12/09/87	2,590
	299-W19-11	12/09/87	784
		12/09/87	1,630
	299-W19-16	12/09/87	194
	299-W19-17	12/09/87	8,160
	299-W19-18	12/08/87	11,600
	299-W19-20	12/08/87	1,330
	299-W19-23	05/15/87	13,000
	299-W19-24	09/15/87	13,700
		05/15/87	16,300
	299-W19-25	09/15/87	10,700
		12/08/87	13,800
	299-W19-26	12/08/87	1,800
216-S Cribs and 241-SX Tank Farm	299-W22-20	08/18/87	85.6
	299-W22-21	09/17/87	906
	299-W22-26	08/18/87	102
	299-W23-01	09/22/87	380
	299-W23-02	12/28/87	5,420
	299-W23-07	09/22/87	2,480
		12/28/87	5,380
200 West Area	699-38-70	09/15/87	2,860
		12/03/87	2,570

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8.0 AQUIFER INTER-COMMUNICATION

The Elephant Mountain Member, the uppermost basalt in the Saddle Mountains Formation, serves as the bottom of the unconfined aquifer and the confining layer of the underlying Rattlesnake Ridge interbed. This sedimentary interbed is considered to be the uppermost confined aquifer in the Separations Area at the Hanford Site.

A report (Graham et al. 1984) identifies areas of complete erosion of the Elephant Mountain basalt near West Lake and near well 699-54-57 and areas of suspected erosion near well 699-47-50 (Figure 27). A potential for downward migration of water from the unconfined aquifer to the confined aquifer, or aquifer intercommunication, exists if the water table of the unconfined aquifer is above the potentiometric surface of the confined aquifer in places where the confining stratum is permeable or missing.

Aquifer intercommunication could result in contamination being introduced into the Rattlesnake Ridge confined aquifer. The report by Graham et al. (1984) concluded that a downward gradient in the eroded areas did not exist in June 1982.

Monitoring of water levels in the unconfined and confined aquifer continued in 1987, along

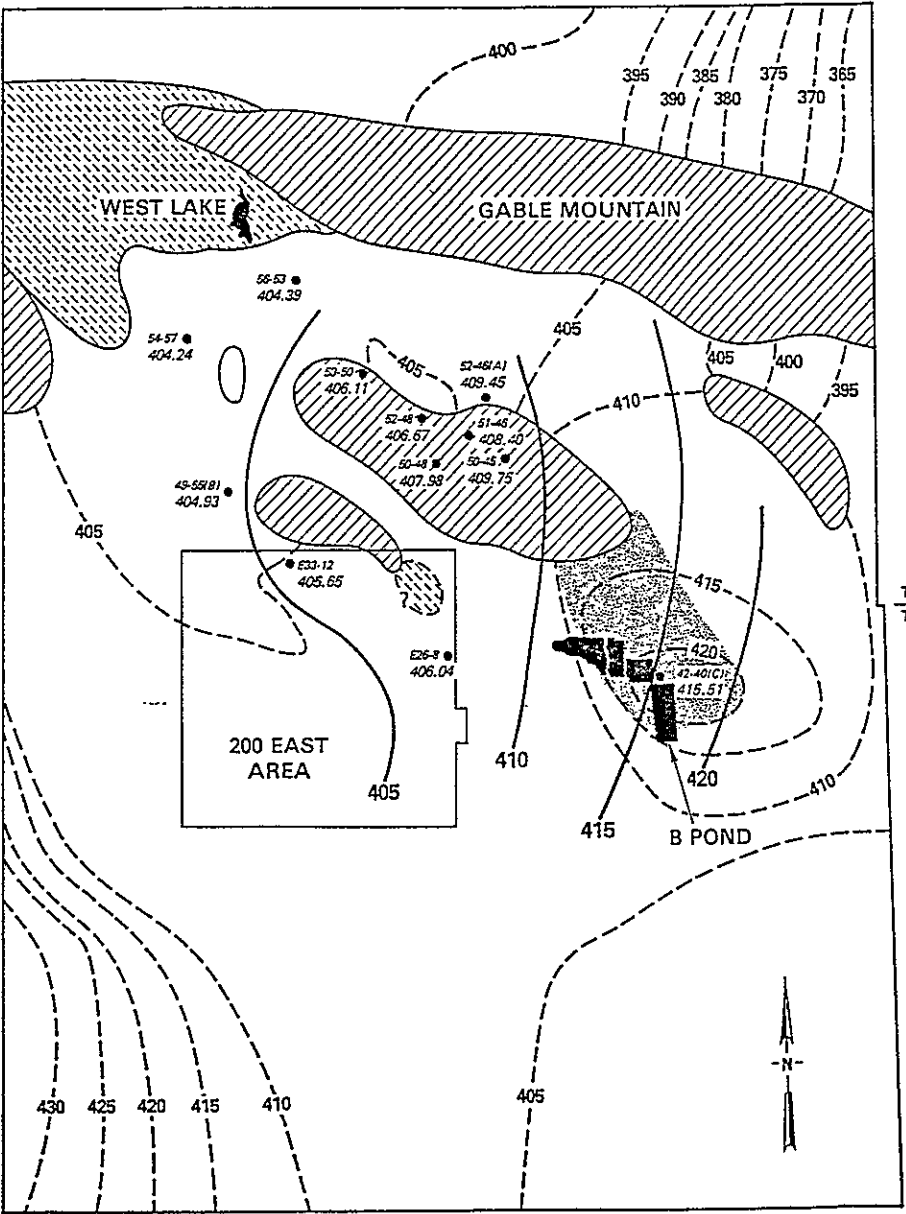
with sample collection and analyses for the tracer constituents tritium and nitrate.

Results of the confined aquifer sampling program are given in Appendix B.2. Well locations are shown in Figure 27. Nitrate concentrations are all below the detection limit of 0.5 or 2.5 ppm, depending on the nitrate analysis procedure used, except for a value of 7.6 ppm in well 699-47-50, which is higher than the concentration reported last year (Law et al. 1987). Tritium concentrations are also mostly below the detection limit of 500 pCi/L, except in wells 699-42-40C and 699-51-46. The high average at the latter well may be caused by an erroneous result because a subsequent sample was below the detection limit. The tritium concentration of 1,000 pCi/L in well 699-42-40C is higher than observed in previous years and may indicate intercommunication. However, this interpretation must await further analyses with a lower detection limit for tritium.

A comparison of the water table of the unconfined aquifer and the potentiometric surface of the confined aquifer, based on December 1987 measurements, is depicted in Figure 27. The area with a downward hydraulic gradient east of 200 East Area is similar to that reported for December 1986 (Law et al. 1987). Well 699-42-40C is located in this area, which reinforces the need for tritium analyses with a lower detection limit.

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COMPARISON OF POTENTIOMETRIC
SURFACE OF THE RATTLESNAKE RIDGE
CONFINED AQUIFER WITH THE WATER
TABLE OF THE UNCONFINED AQUIFER

DECEMBER 1987

- 400 — POTENTIOMETRIC SURFACE OF THE RATTLESNAKE RIDGE IN FEET ABOVE MEAN SEA LEVEL (ft MSL)
- - - 420 - - - WATER-TABLE CONTOURS IN FEET ABOVE MEAN SEA LEVEL (ft MSL)
- [Hatched Area] AREAS OF COMPLETE EROSION OF THE ELEPHANT MOUNTAIN BASALT (from RHO-RE-ST-12)
- [Stippled Area] AREAS OF DOWNWARD HYDRAULIC GRADIENT
- 53-50 • CONFINED WELLS USED IN PREPARATION OF MAP
- [Solid Black Shape] POND
- [Diagonal Lines] BASALT OUTCROPS ABOVE WATER TABLE, AS INFERRED 6/1984

THE RATTLESNAKE RIDGE AQUIFER, WHICH IS CONFINED BY THE ELEPHANT MOUNTAIN BASALT, IS MONITORED QUARTERLY IN THE EASTERN PORTION OF THE SEPARATIONS AREA. THE DECEMBER 1987, WATER-LEVEL MEASUREMENTS IN 13 WELLS COMPLETED IN THE RATTLESNAKE RIDGE INTERBED WERE USED TO CONTOUR THE POTENTIOMETRIC SURFACE OF THE AQUIFER. AREAL EXTENT OF DOWNWARD HYDRAULIC GRADIENT FROM THE UNCONFINED AQUIFER TO THIS CONFINED AQUIFER IS INFERRED FROM THE WATER-TABLE MAP AND THE CONTOURS OF THE POTENTIOMETRIC SURFACE OF THE RATTLESNAKE RIDGE. THIS AREA REPRESENTS THE ZONE IN WHICH DOWNWARD FLOW MIGHT OCCUR IF A PATHWAY IS AVAILABLE, SUCH AS ABSENCE OF THE ELEPHANT MOUNTAIN BASALT DUE TO EROSION OR OF SUFFICIENTLY HIGH HYDRAULIC CONDUCTIVITY IN THE BASALT. SINCE DECEMBER 1986, THE ZONE OF THE DOWNWARD HYDRAULIC GRADIENT HAS SLIGHTLY DECREASED IN SIZE.

THE POTENTIOMETRIC SURFACE OF THE RATTLESNAKE RIDGE CONFINED AQUIFER MAP IS PREPARED BY THE ENVIRONMENTAL TECHNOLOGY SECTION OF THE DEFENSE WASTE MANAGEMENT DIVISION OF WESTINGHOUSE HANFORD COMPANY.

NOTE:
TO CONVERT TO METRIC, MULTIPLY
ELEVATION (ft) BY 0.3048 TO OBTAIN
ELEVATION (m)

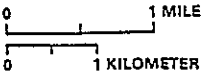


Figure 27. Comparison of Potentio metric
Surface of the Rattlesnake Ridge Confined
Aquifer with the Water Table of the Un-
confined Aquifer, December, 1987.

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9.0 SUMMARY

The Separations Area ground-water monitoring network for CY 1987 consisted of 149 wells.

Samples from wells in the monitoring network were collected on a monthly, quarterly, or semiannual schedule, depending on the history of the liquid waste disposal site. Samples were analyzed selectively for total alpha, total beta, tritium, ^{90}Sr , ^{137}Cs , ^{60}Co , ^{106}Ru , total uranium, and nitrate. Additionally, routine analyses were supplemented with special sampling at a few wells for ^{99}Tc , ^{129}I , and isotopic uranium and plutonium. The results of ground-water monitoring indicate that average concentrations of contaminants in most wells were essentially the same in 1987 as in 1986.

For active facilities, the following radionuclides exceeded either the DCG (which is applicable at the point of actual exposure to the public) or the internal ACL (specified in RHO-MA-139):

<u>Active Site</u>	<u>Contaminant</u>	<u>Guideline Exceeded</u>
216-A-10 Crib	Tritium ^{129}I	DCG ACL
216-A-25 Pond	^{90}Sr	ACL
216-A-36B Crib	Tritium ^{129}I	DCG ACL
216-A-37-1 Crib	Tritium	DCG
216-A-45 Crib	Tritium	DCG
216-B-62 Crib	Uranium	ACL

The 216-A-10 Crib and the 216-A-25 Pond were deactivated in 1987, and effluent discharge to the 216-A-36B Crib has ceased. Tritium in the ground water at the 216-A-37-1 and 216-A-45 Crib is expected to fall below the DCG before reaching the river. Uranium concentrations beneath the 216-B-62 Crib are declining and should be below the ACL in 1988.

For inactive facilities, the following radionuclides exceeded either the DCG (applicable at the point of actual exposure to the public) or the Westinghouse Hanford ACL:

<u>Inactive Site</u>	<u>Contaminant</u>	<u>Guideline Exceeded</u>
216-B-5 Reverse Well	^{90}Sr ^{137}Cs	DCG and ACL ACL
216-B-48/49/50 Crib	^{99}Tc	ACL
216-U-1/2 Crib	Uranium ^{99}Tc	DCG and ACL ACL
216-U-8 Crib	Uranium	ACL
216-U-10 Pond	Uranium	ACL

The contamination at the 216-B-5 reverse well is localized and stable. The uranium found in the ground water beneath 200 West Area, including the new 216-U-17 Crib, which will become active in 1988, is the subject of a planned investigation aimed at identifying the sources and extent of the plume. The cause and significance of ^{99}Tc contamination is also under evaluation.

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APPENDIX A

**WELL NUMBERING SYSTEM, FACILITY NUMBERING SYSTEM,
DEFINITION OF THE SEPARATIONS AREA,
WELL LOCATION MAPS**

9 2 1 2 5 0 0 0 8 5 4

CONTENTS

A.1 Well Numbering System	A-3
A.2 Facility Numbering System	A-4
A.3 Definition of the Separations Area	A-5
A.4 Well Location Maps	A-7

9 2 1 2 5 0 0 0 8 6 5

A.1 WELL NUMBERING SYSTEM

A detailed description of the well numbering system is given in McGhan et al. (1985). The numbering system used for well identification in the 200 Areas is a three-part system, comprised of seven digits and one letter separated by dashes (i.e., 299-E25-21). The first set of digits (299) identifies it as a well (99) in one of the 200 Areas. The second part contains the prefix E or W for 200 East or 200 West Area, and is followed by a two-digit block number (E25). These block numbers are denoted in McGhan et al. (1985) for the 200 East and 200 West Areas. The third part (21) represents the consecutive numbering of a well constructed in a given block. For example, well 299-E25-21 is identified as the 21st well drilled in block 25 of 200 East Area.

Wells in the 600 Area use a different coding system. The well identification number contains three parts. The first part (699) identifies it as a well (99) in the 600 Area. The second and third parts represent the north and west Hanford Site coordinates of a well expressed in 10,000 ft. For example, well 699-35-70 has the coordinates of N34523 and W69988 (McGhan et al. 1985). Letters are added when more than one well in a zone is described by the same coordinates, such as 699-42-40A and 699-42-40B.

REFERENCE

McGhan, V. L., P. J. Mitchell, and R. S. Argo, 1985, Hanford Wells, PNL-5397, Pacific Northwest Laboratory, Richland, Washington.

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A.2 FACILITY NUMBERING SYSTEM

The facility numbering system is a five- or six-digit, one-letter system separated with dashes (e.g., 216-A-37-2). Liquid waste disposal facilities (crib facilities, ponds, and ditches) are identified as 216-sites; Tank Farms as 241-sites.

The letter in the second part of the number represents a zone: A, B, C, E are zones in 200 East Area, and S, T, U, W, Z are zones in 200 West Area. The third part of the number represents consecutive numbering within a zone. In some cases, an additional identification tag has been included. For example, site 216-A-37-2 is the 37th liquid waste disposal site in Zone A of the 200 East Area. The (-2) differentiates this facility from 216-A-37-1. In other cases, a letter is added. For example, site 216-A-36B represents the 36th facility in block A of 200 East Area.

The facility number may be modified for use at Tank Farms. For example, 241-A Tank Farm, 241-AX Tank Farm, 241-AY Tank Farm, or 241-AZ Tank Farm. The third part of the Tank Farms numbering system is defined as the number assigned to that tank within the farm, such as 241-A-103 Tank.

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A.3 DEFINITION OF THE SEPARATIONS AREA

For the purpose of ground-water monitoring the Separations Area is defined on the basis of the U.S. Public Land System and is composed of 80 sections of land in 6 townships as follows:

- T12N, R25E:* Sections 1, 2, 11, 12, 13, 14, 23, 24
- T12N, R26E: Sections 1 through 24
- T12N, R27E: Sections 5, 6, 7, 8, 17, 18, 19, 20
- T13N, R25E: Sections 13, 14, 23, 24, 25, 26, 35, 36
- T13N, R26E: Sections 13 through 36
- T13N, R27E: Sections 17, 18, 19, 20, 29, 30, 31, 32

These townships are referenced to the Williamette meridian. The location of these townships and sections with respect to the 200 East and 200 West Areas and other Hanford Site features is depicted in Figure A-1.

*Read as "township 12 north, range 25 east."

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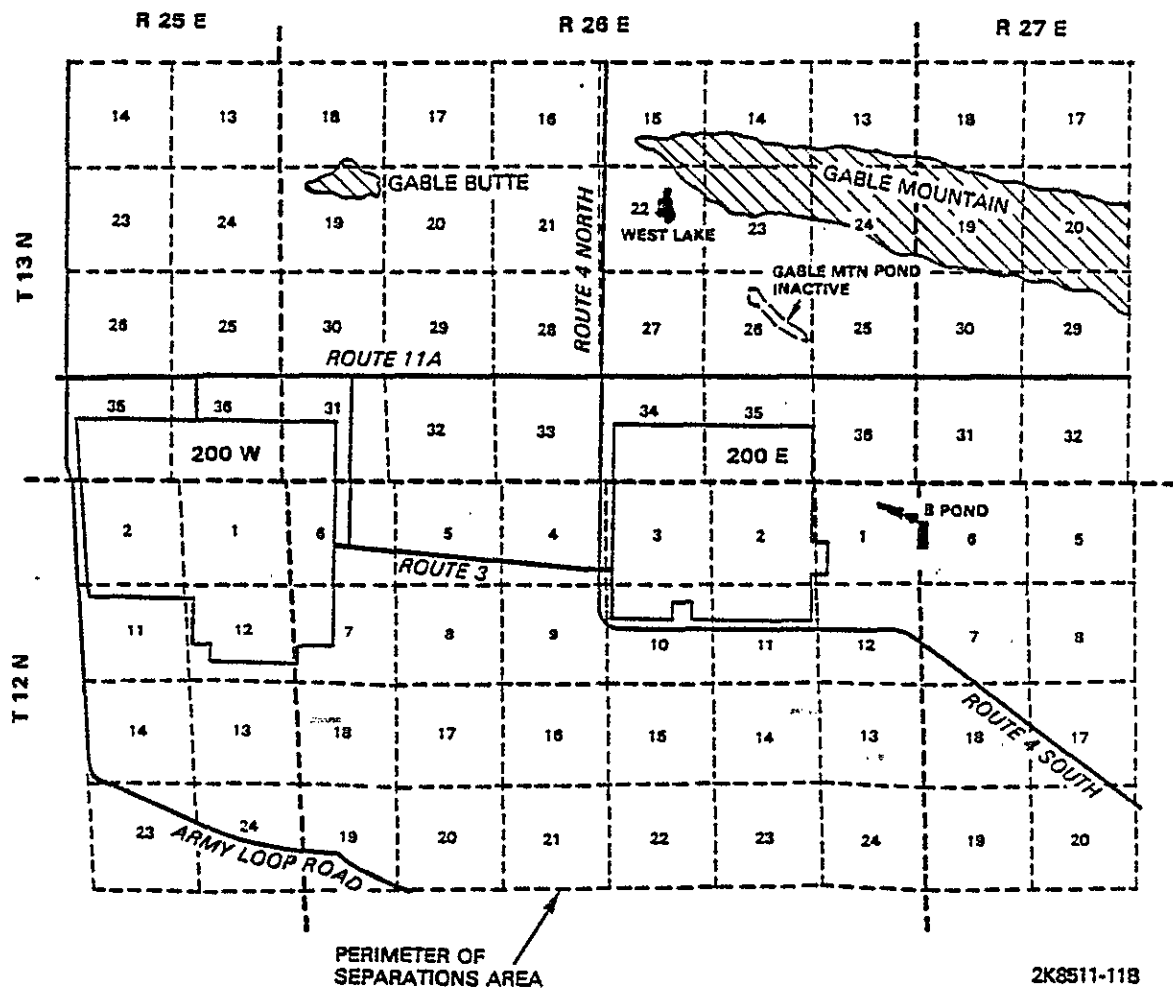


Figure A-1. Definition of the Separations Area for Ground-Water Monitoring.

A.4 WELL LOCATION MAPS

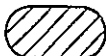
Well location maps for the Separations and the affected Areas are shown in Figures A-2 through A-25.

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Separations Area Selected Sampling Well Location Map

 Estimated Basalt Outcrops
Above Water Table

NOTE:

Well Identification Numbers Beginning
with W or E are Prefixed with 299.
All Other Well Identification Numbers
are Prefixed with 699.

0 1 Mile
0 1 Kilometer

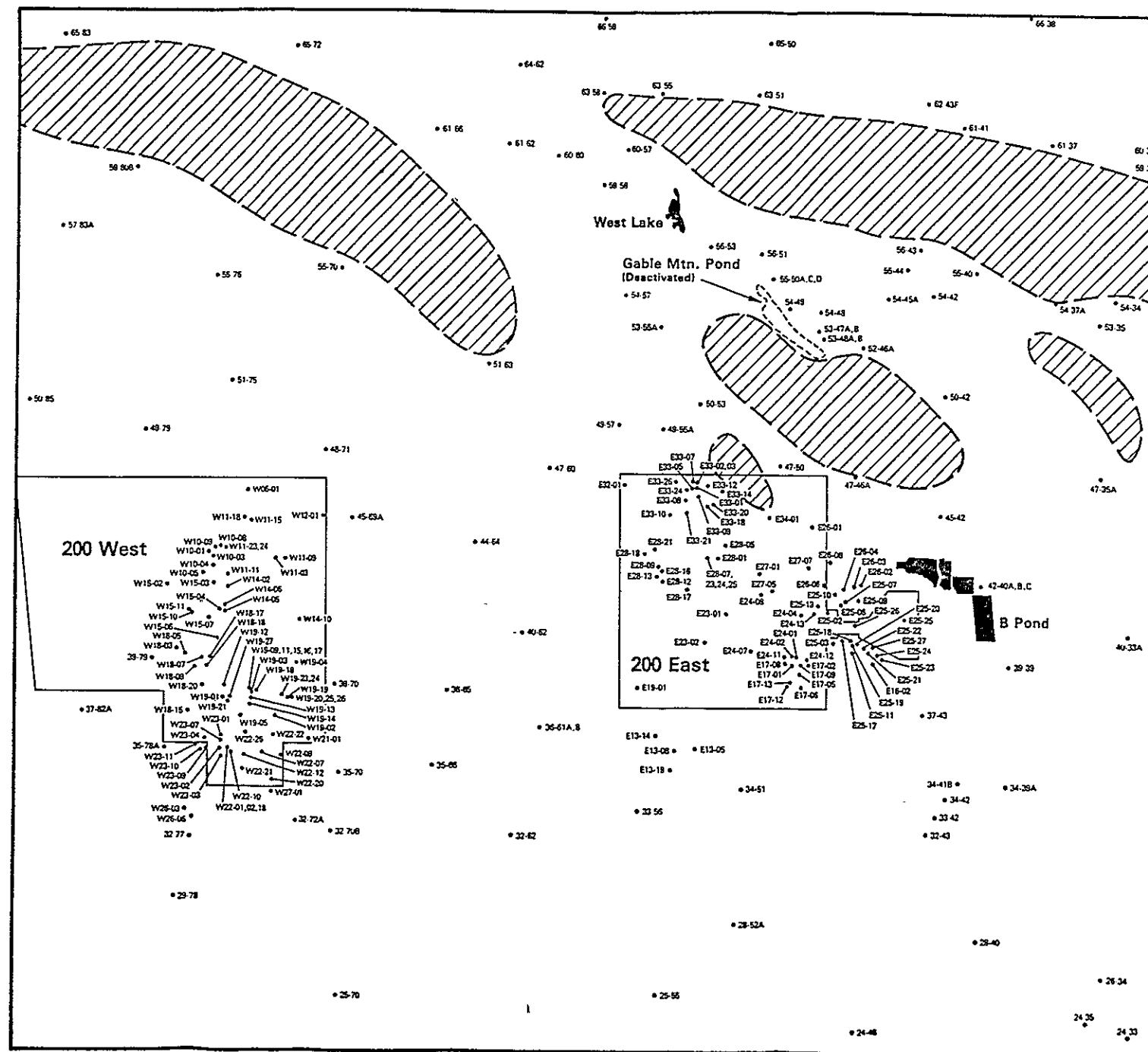
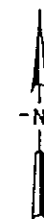


Figure A-2. Selected Sampling Wells in the
Separations Area.

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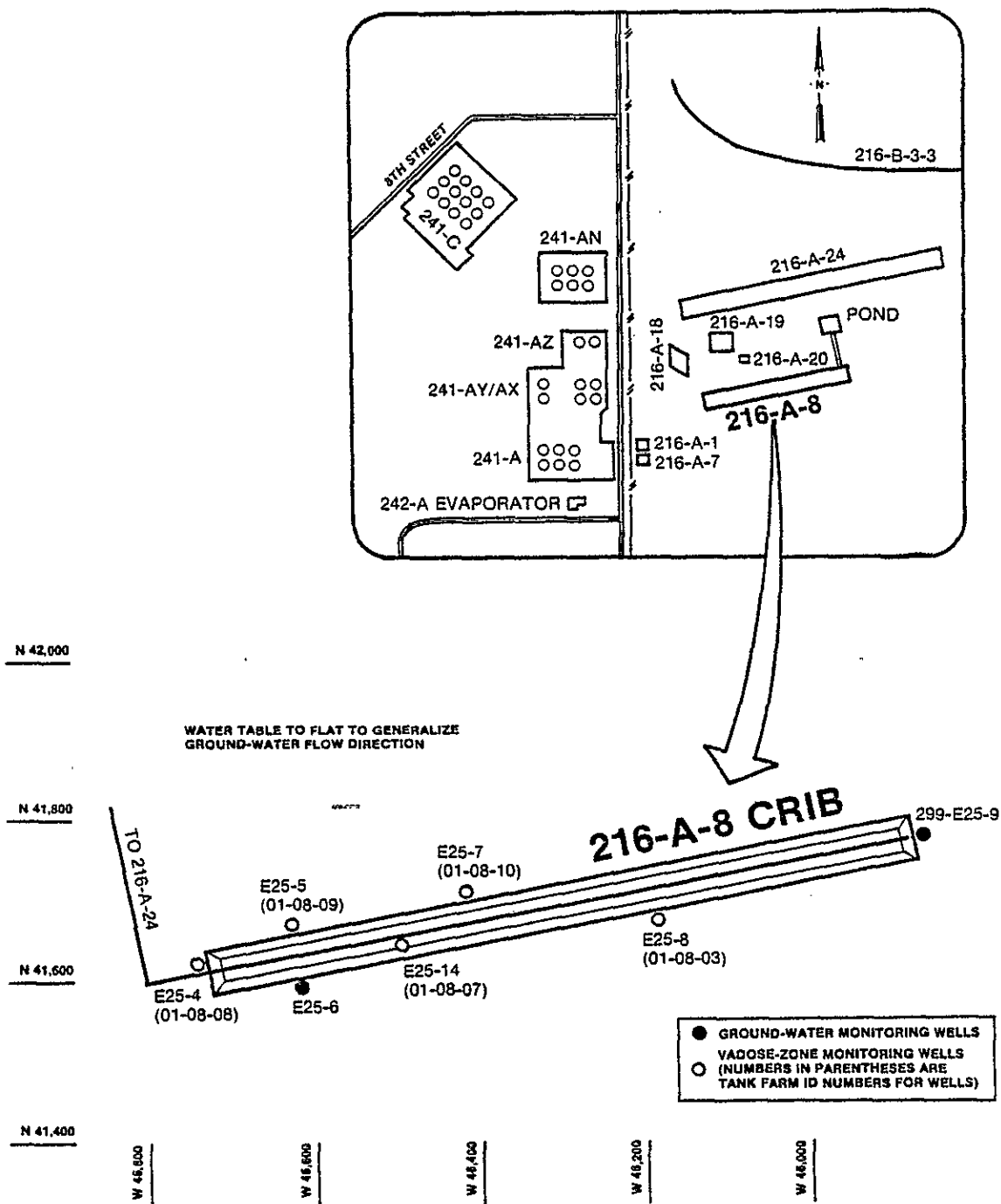


Figure A-3. Site Map of Active 216-A-8 Crib Showing Well Locations.

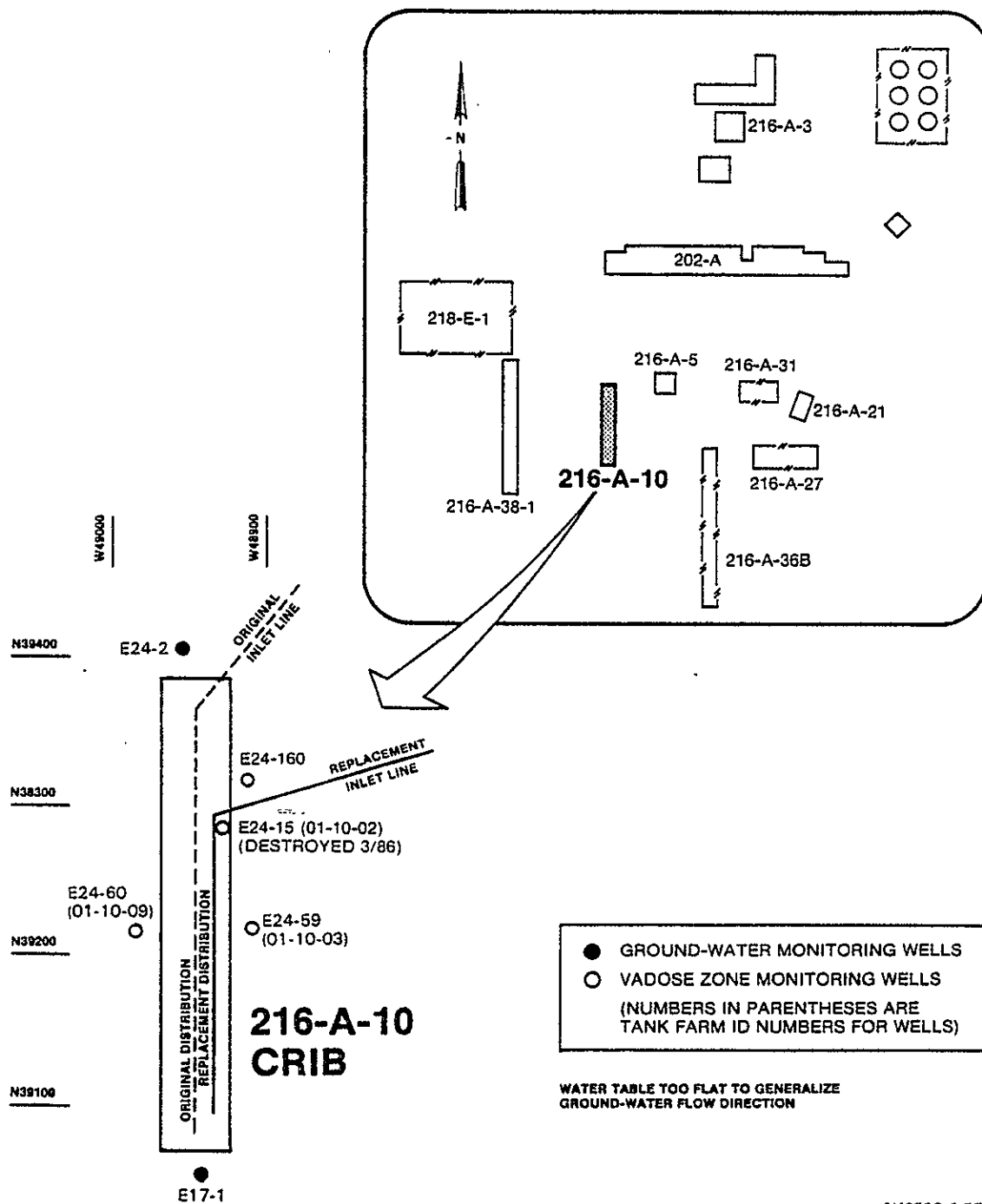


Figure A-4. Site Map of Active 216-A-10 Crib Showing Well Locations.

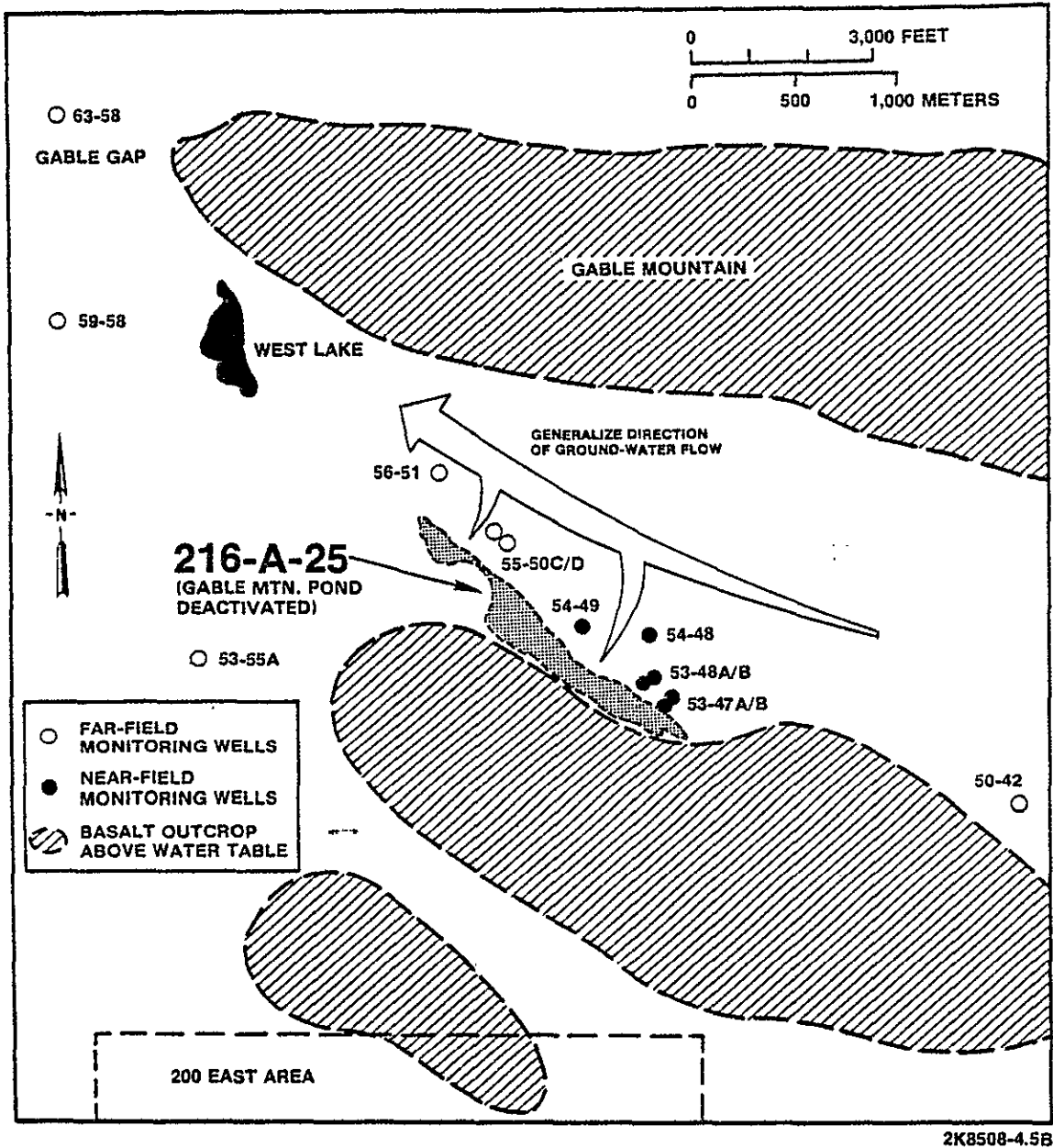


Figure A-5. Site Map of the Deactivated 216-A-25 Pond Showing Well Locations.

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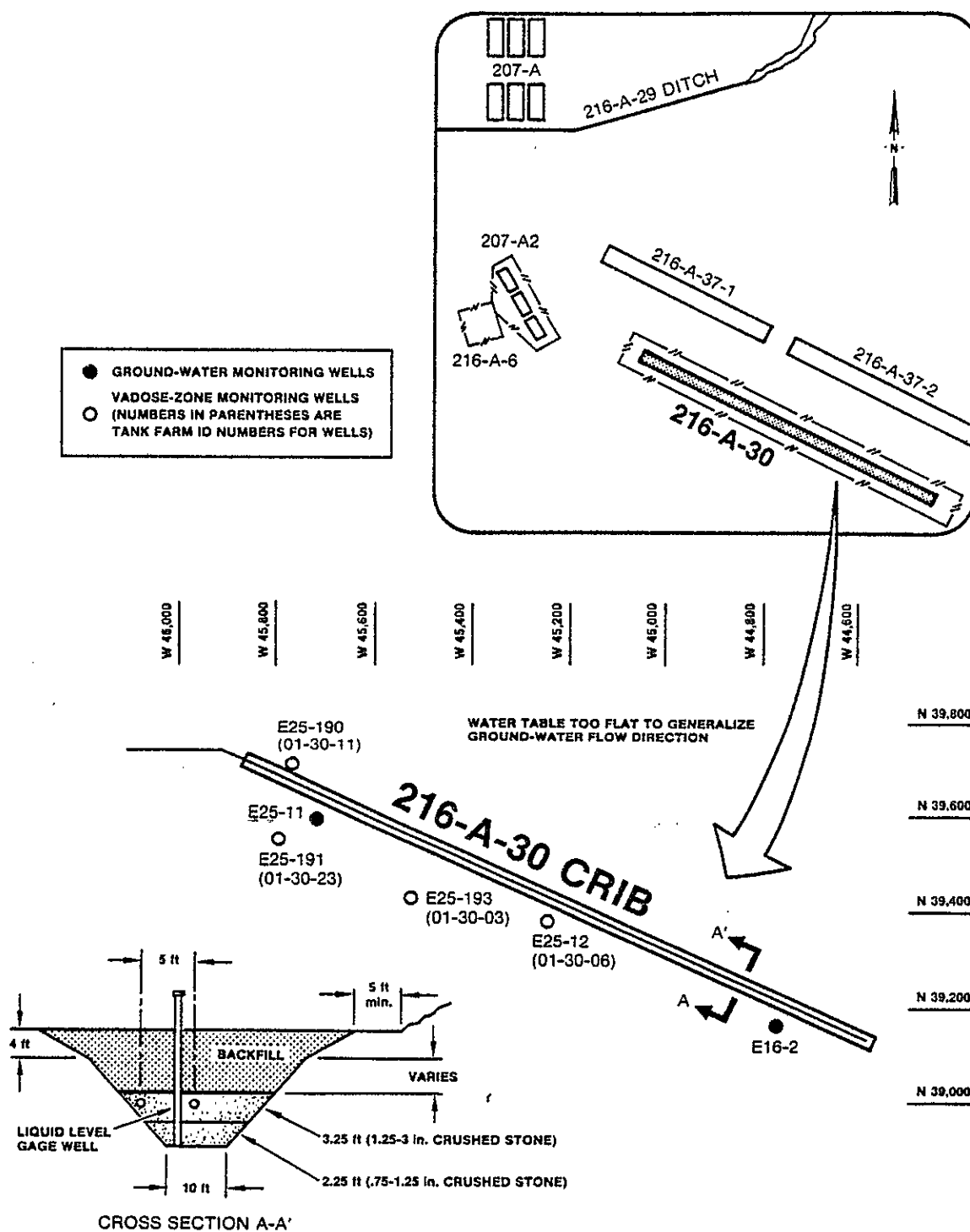
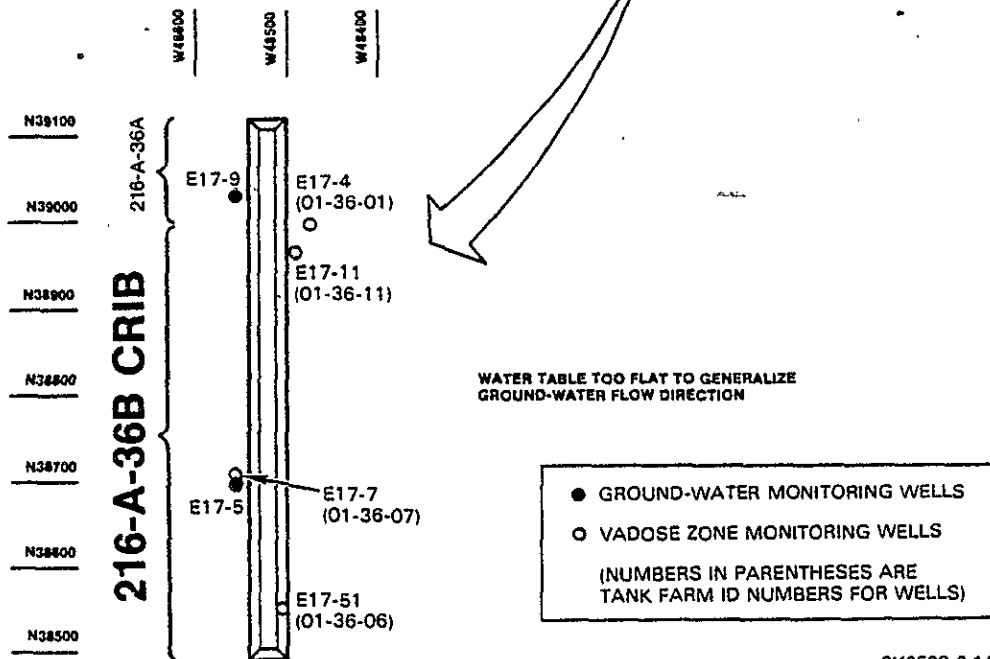
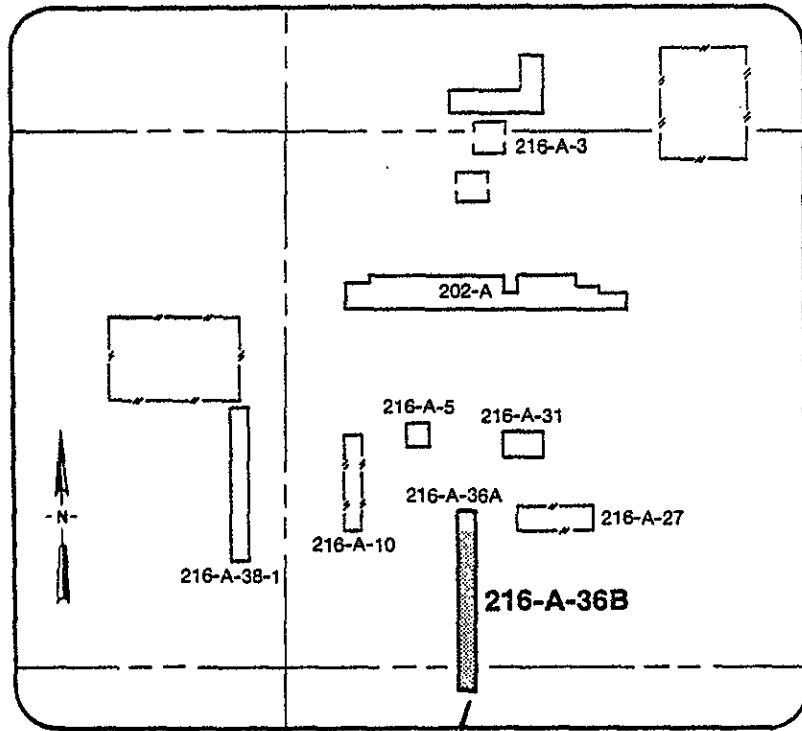


Figure A-6. Site Map of Active 216-A-30 Crib Showing Well Locations.



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Figure A-7. Site Map of Active 216-A-36B Crib Showing Well Locations.

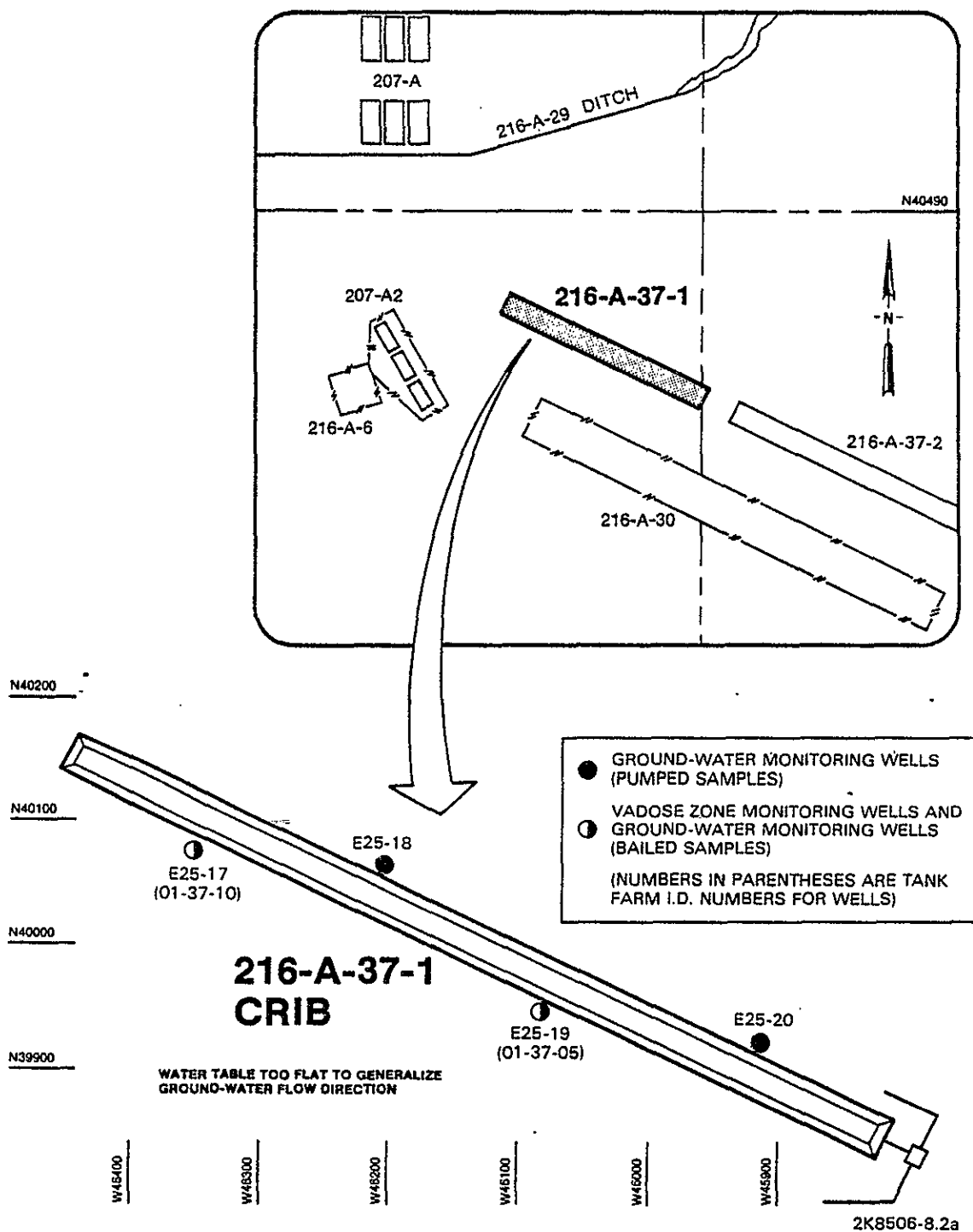


Figure A-8. Site Map of Active 216-A-37-1 Crib Showing Well Locations.

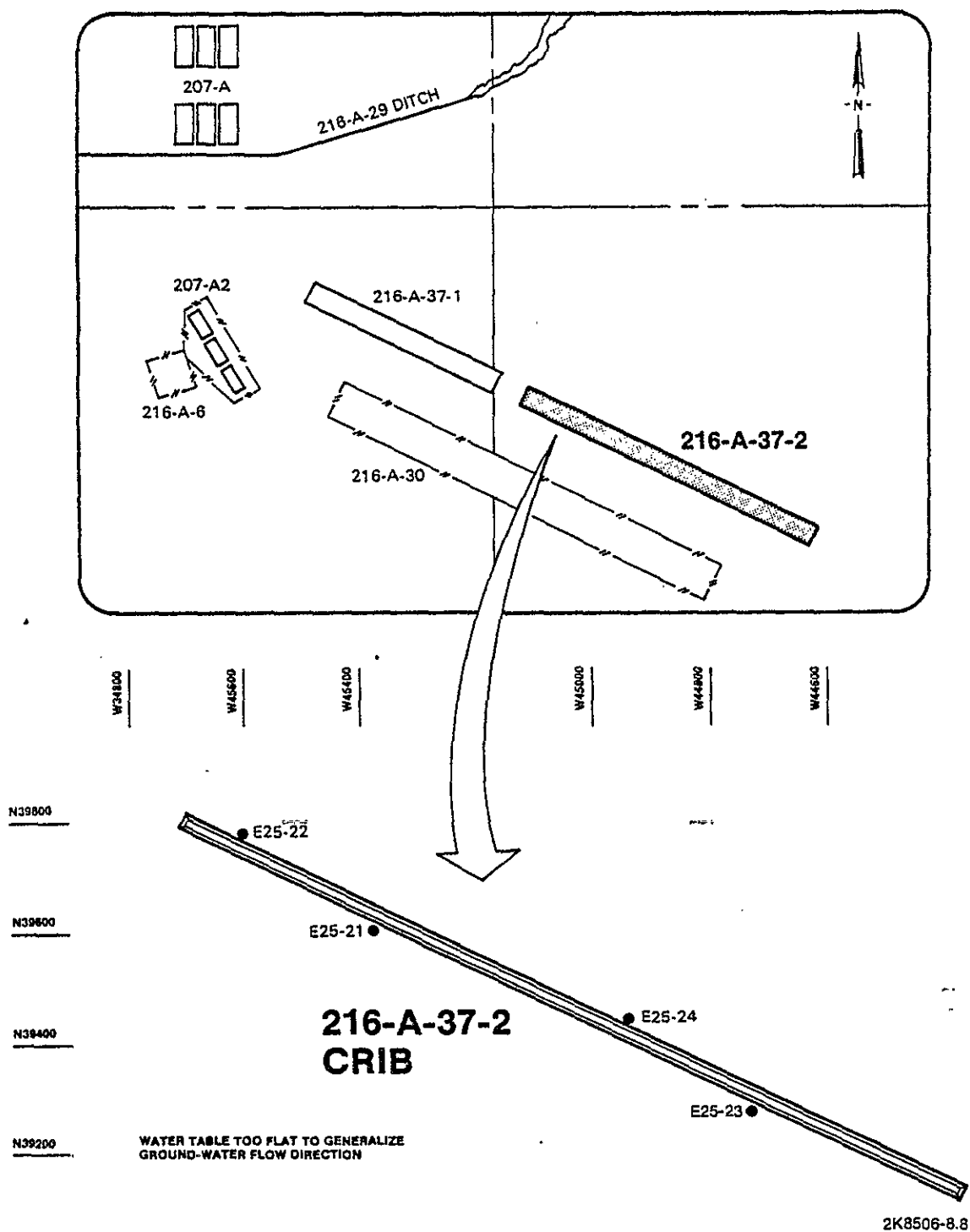


Figure A-9. Site Map of Active 216-A-37-2 Crib Showing Well Locations.

LEGEND

- GROUND-WATER MONITORING WELLS
(PUMPED SAMPLES)
- VADOSE ZONE MONITORING WELLS
(NUMBERS IN PARENTHESES ARE TANK
FARM I.D. NUMBERS FOR WELLS)

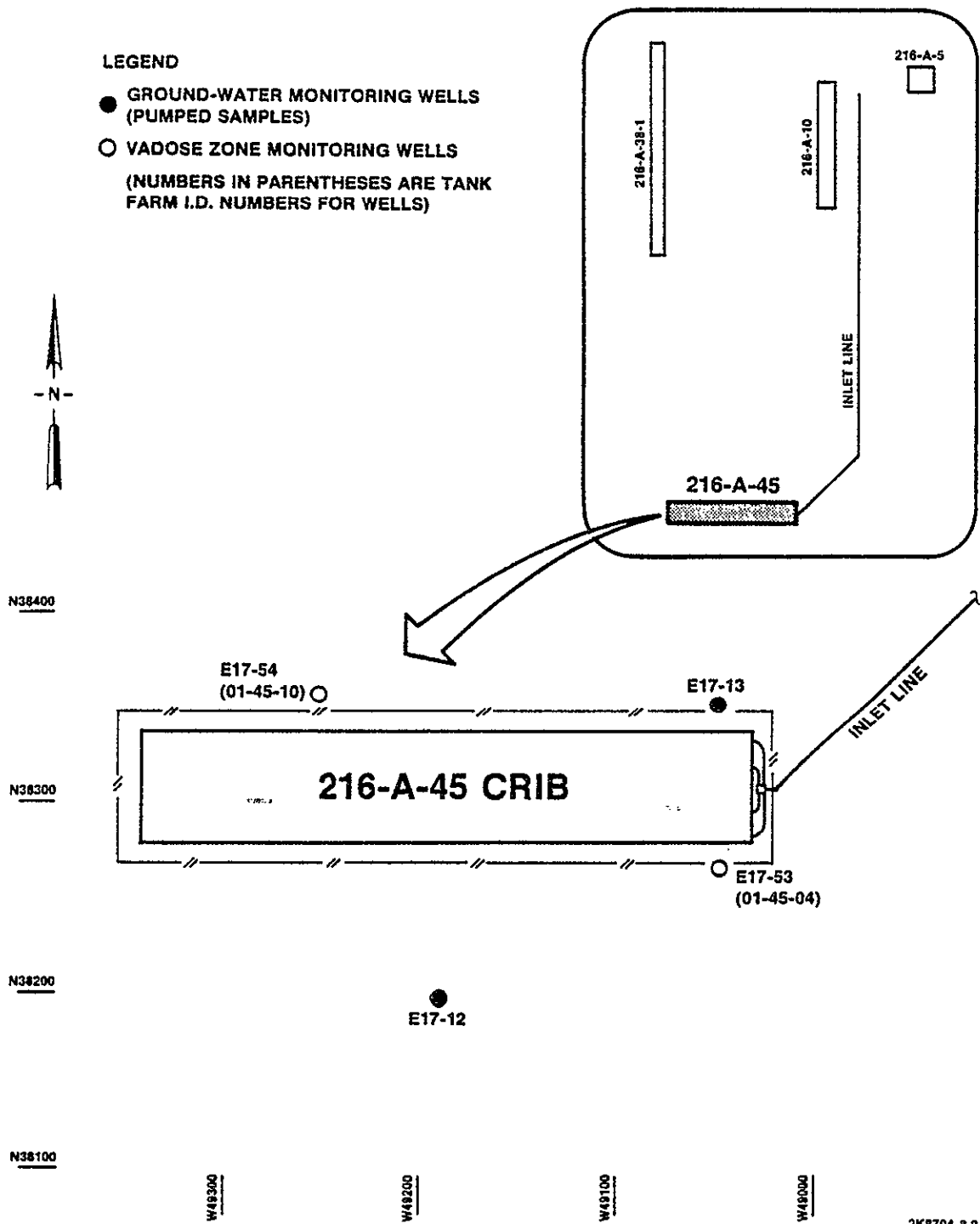
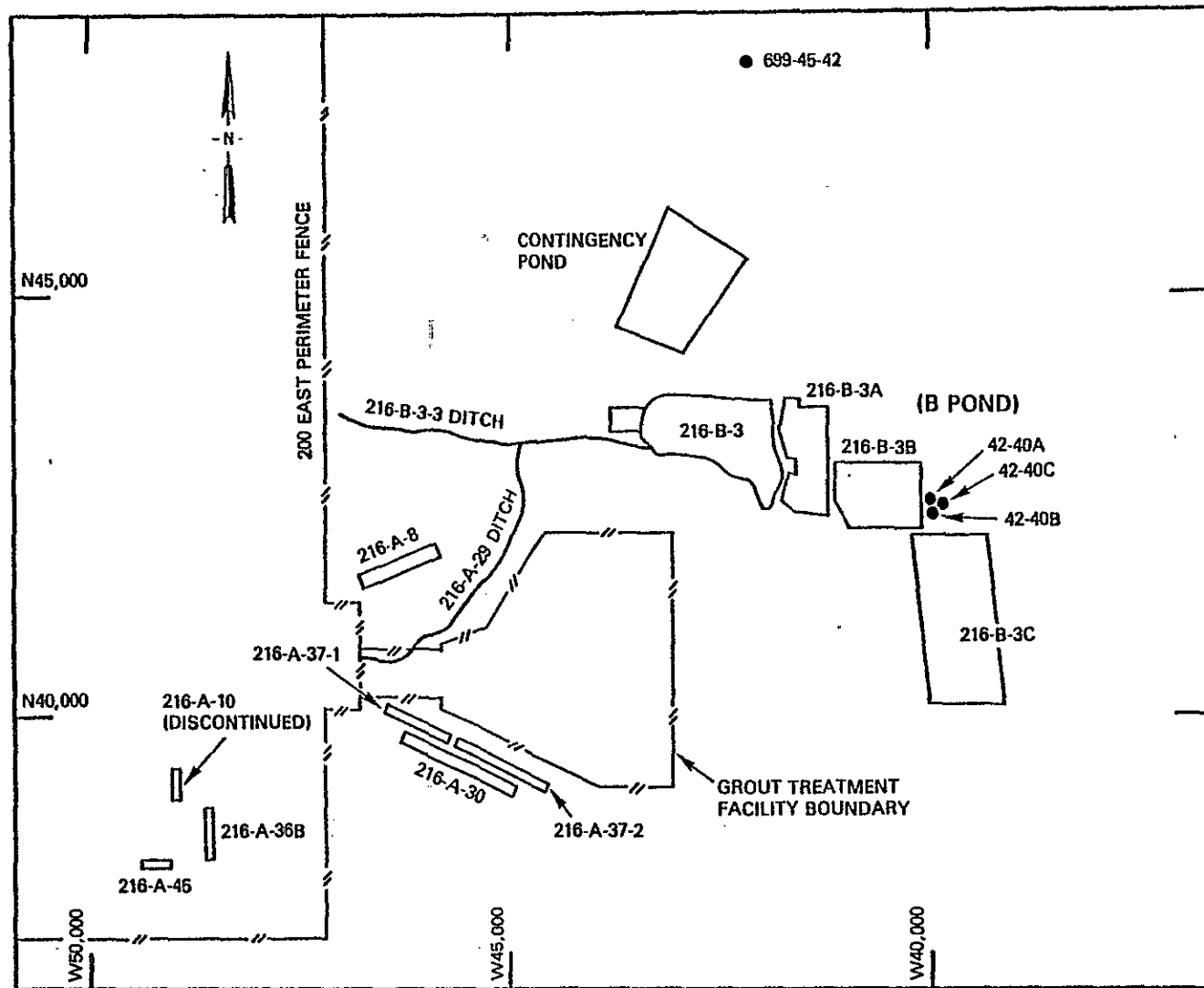


Figure A-10. Site Map of Active 216-A-45 Crib Showing Well Locations.

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A-19

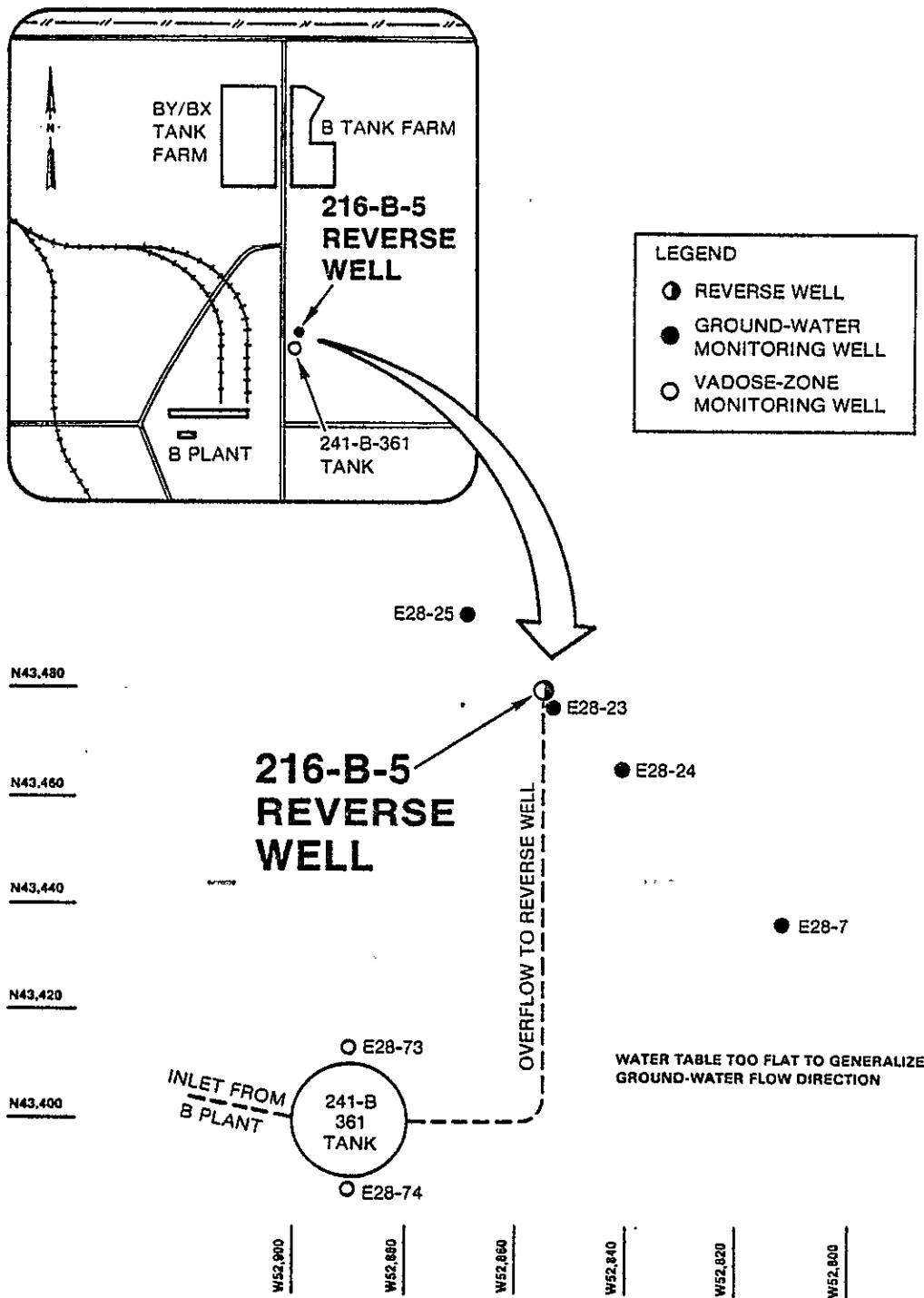


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Figure A-11. Site Map of Active 216-B-3 Pond Showing Well Locations.

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Figure A-12. Site Map of Inactive 216-B-5 Reverse Well Showing Well Locations.

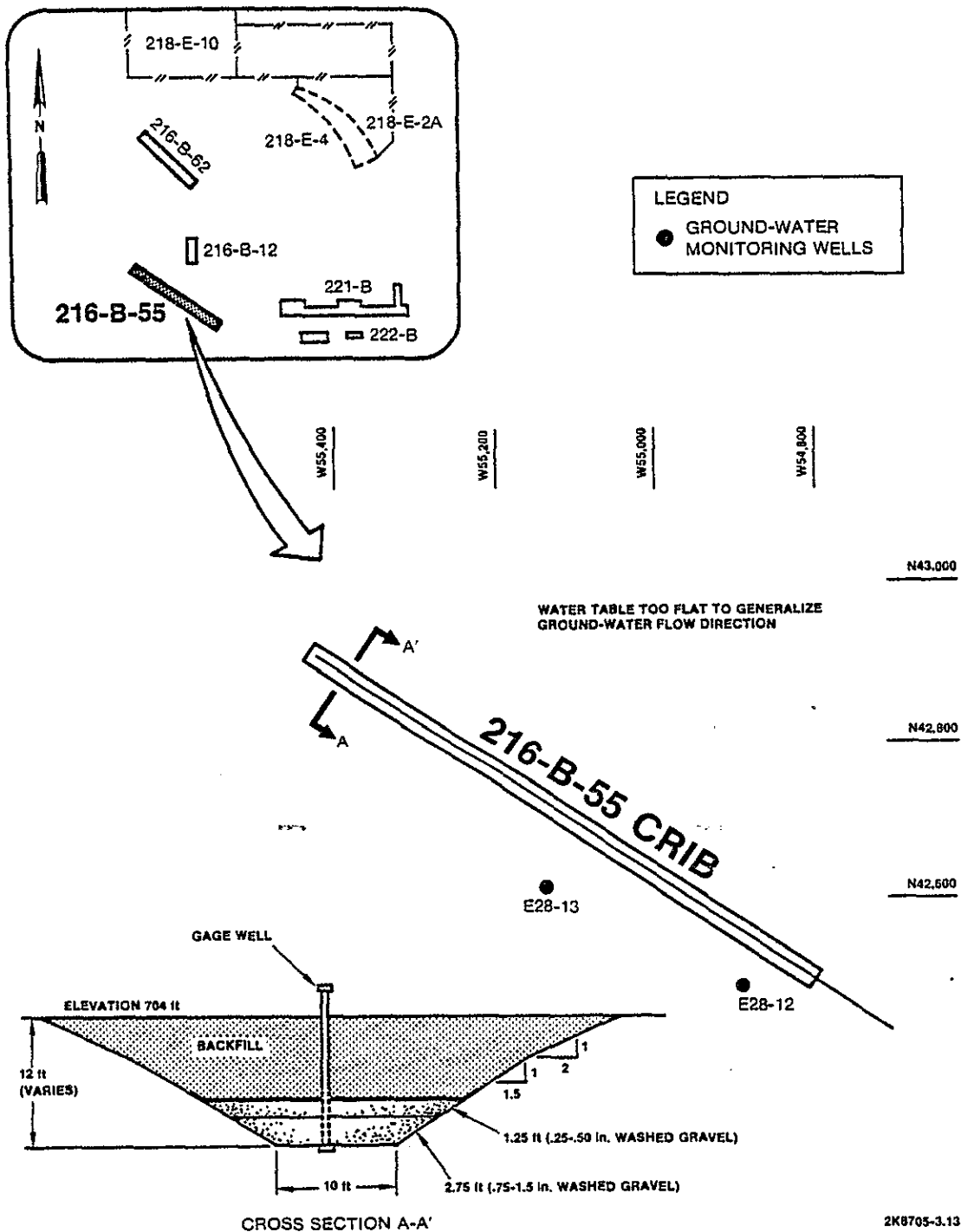
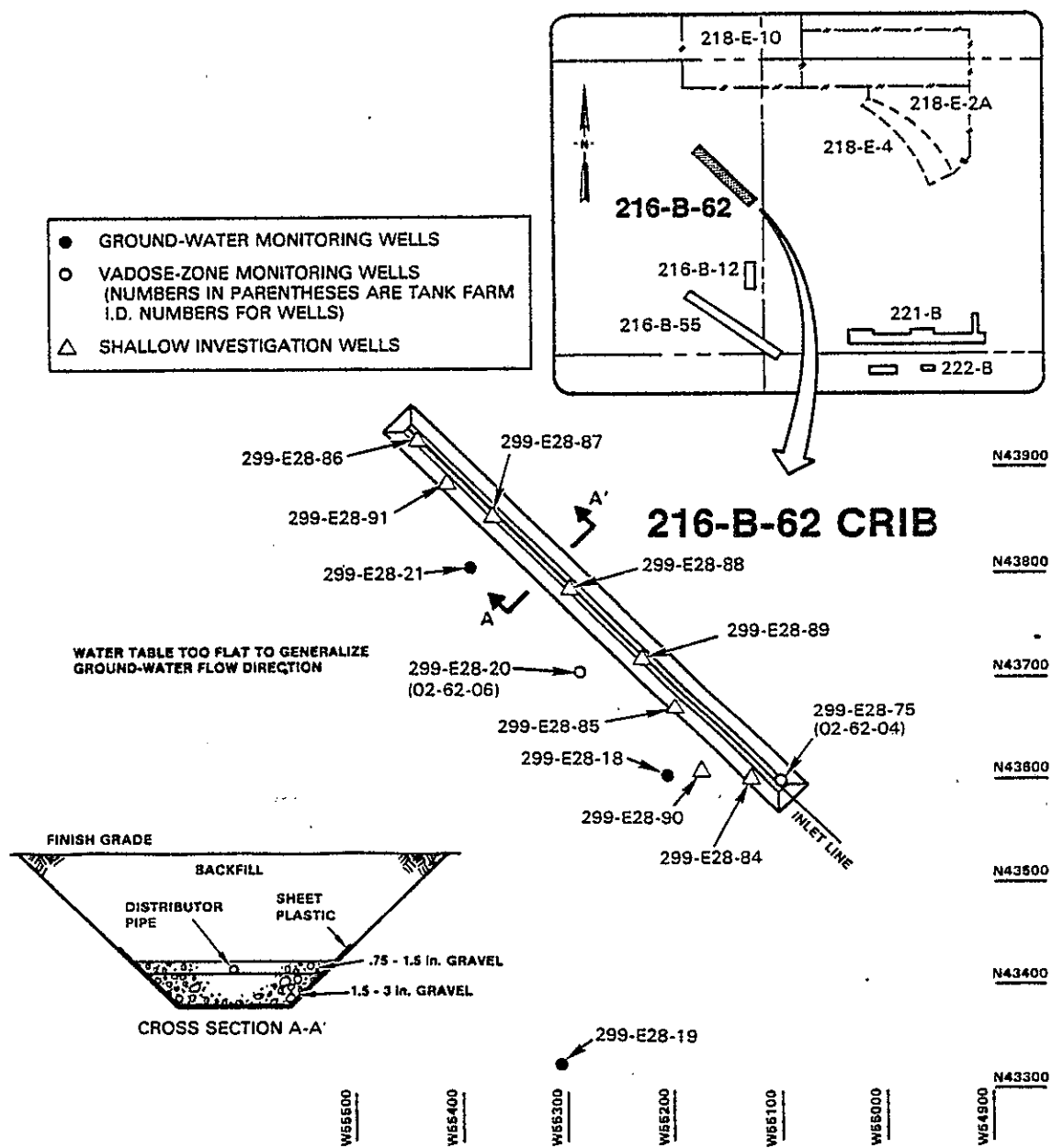


Figure A-13. Site Map of Active 216-B-55 Crib Showing Well Locations.



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Figure A-14. Site Map of Active 216-B-62 Crib Showing Well Locations.

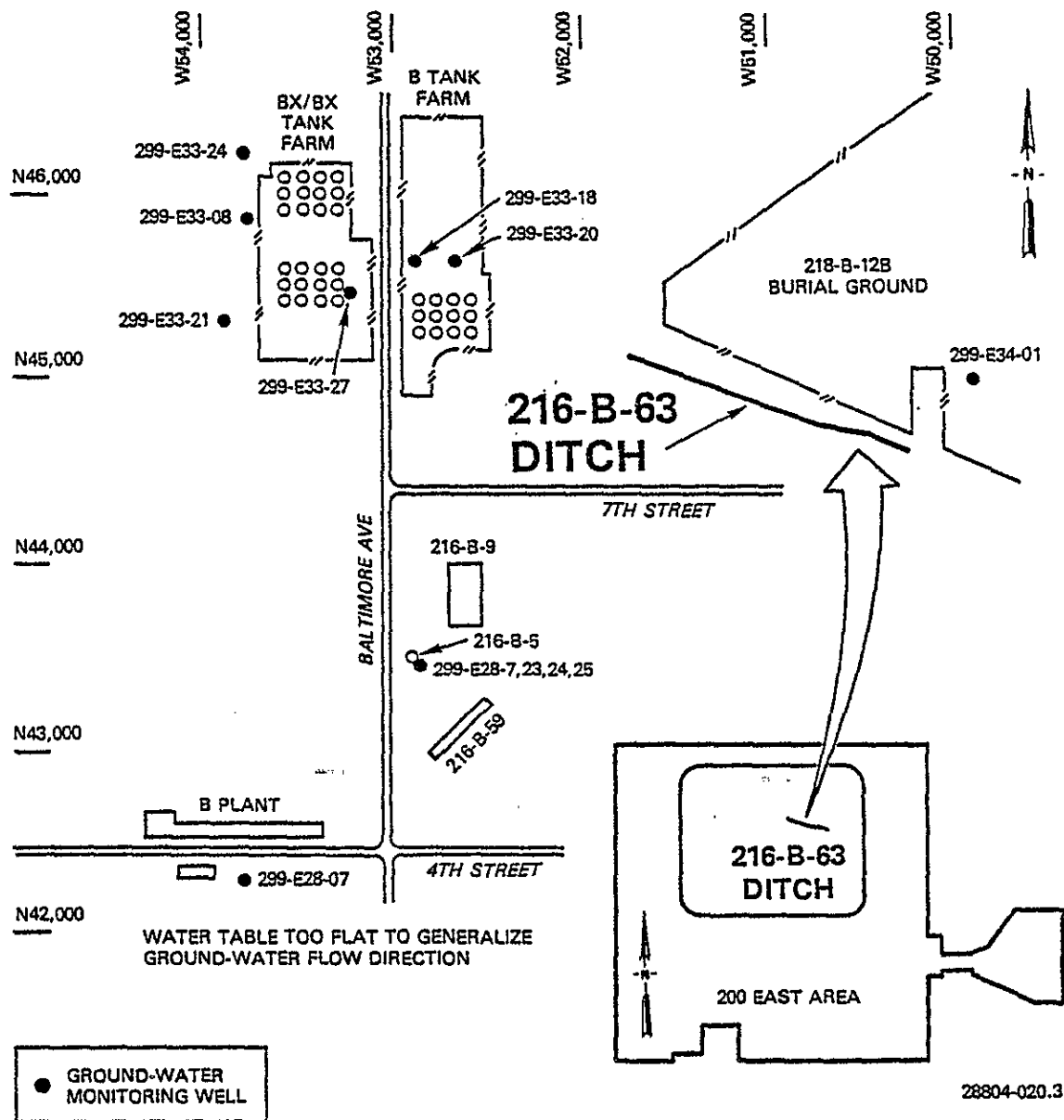
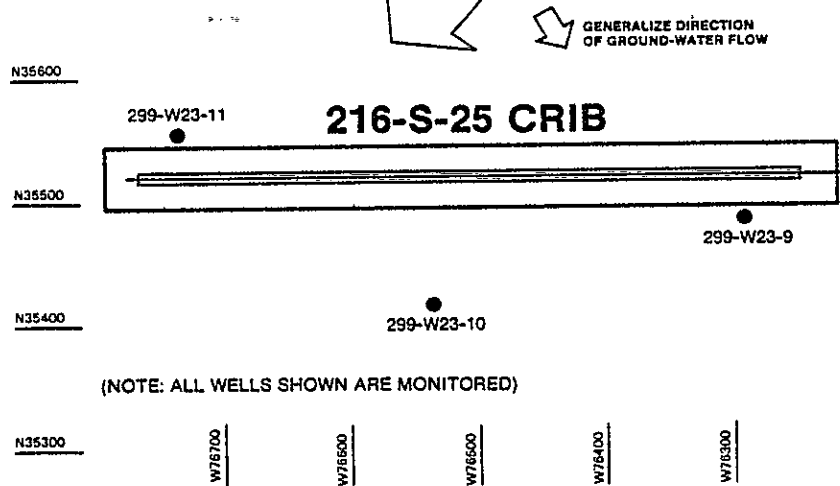
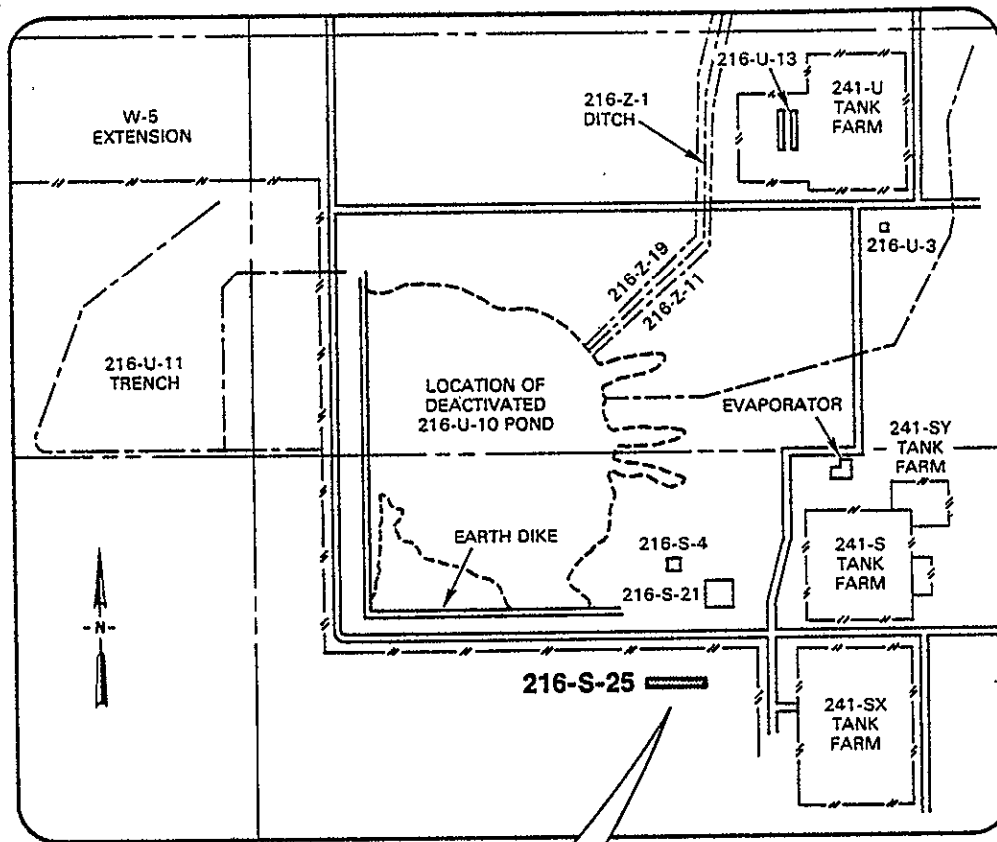


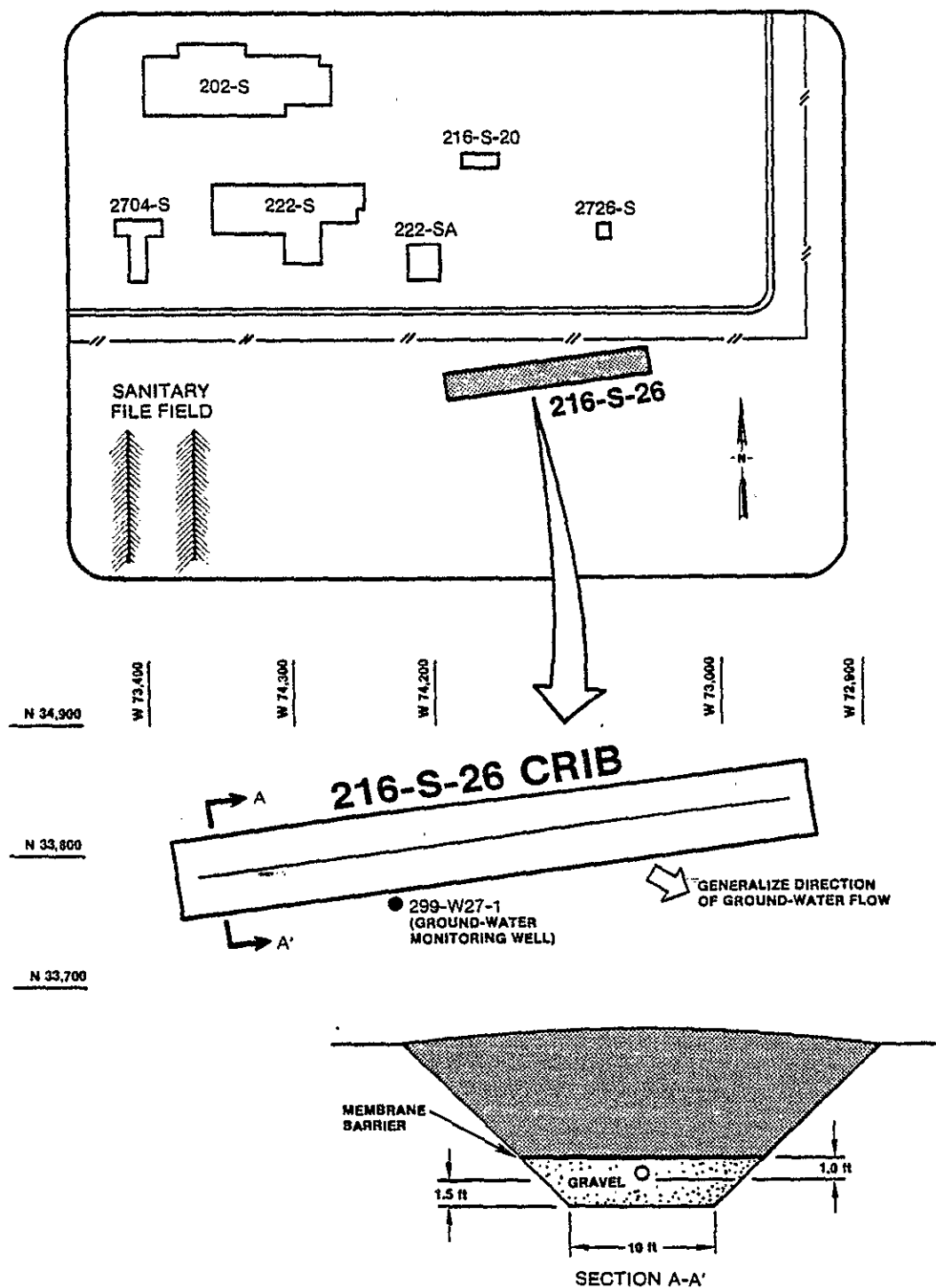
Figure A-15. Site Map of Active 216-B-63 Ditch Showing Well Locations.



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Figure A-16. Site Map of Active 216-S-25 Crib Showing Well Locations.

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Figure A-17. Site Map of Active 216-S-26 Crib Showing Well Locations.

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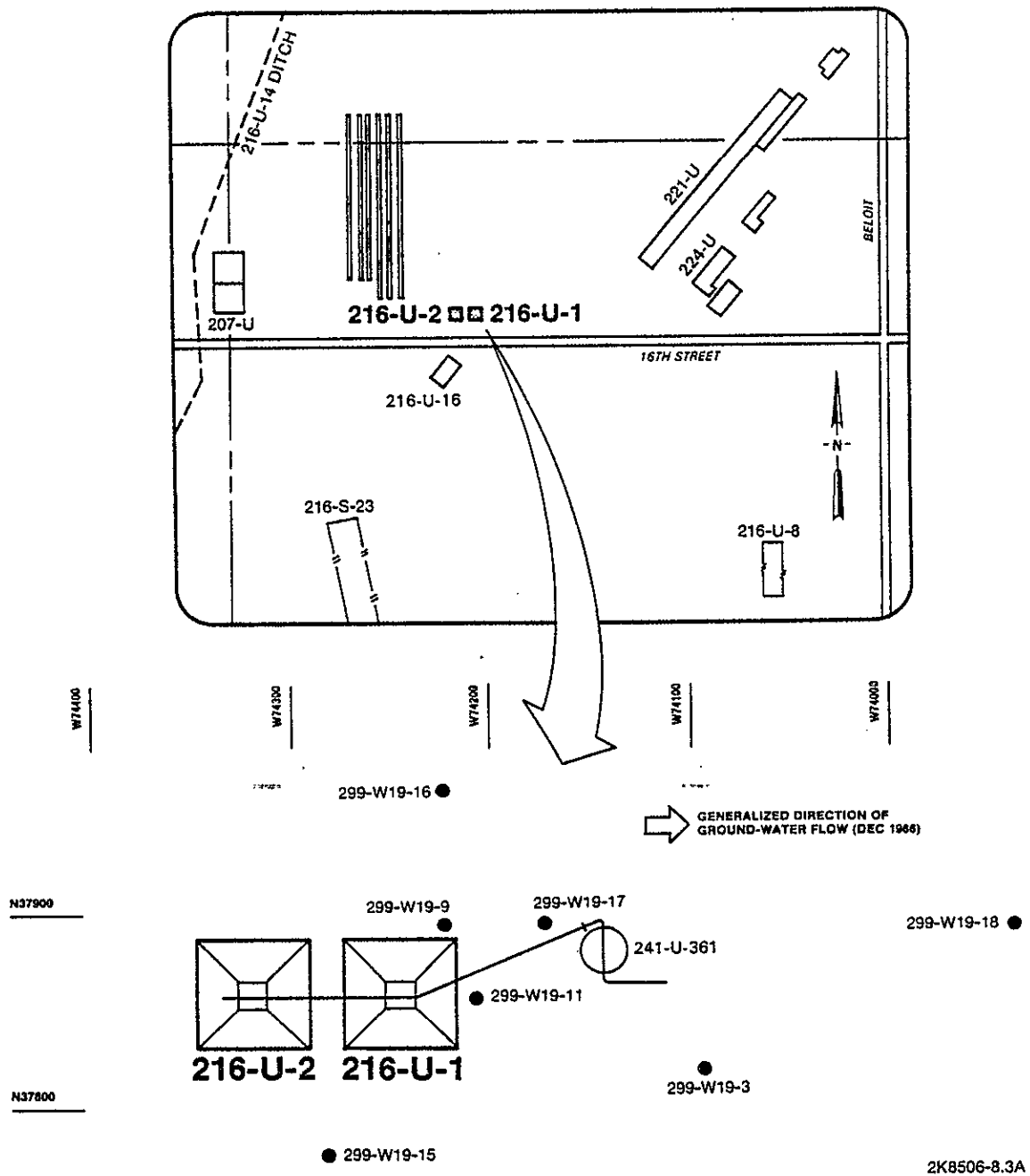


Figure A-18. Site Map of Inactive 216-U-1/2 Cribs Showing Well Locations.

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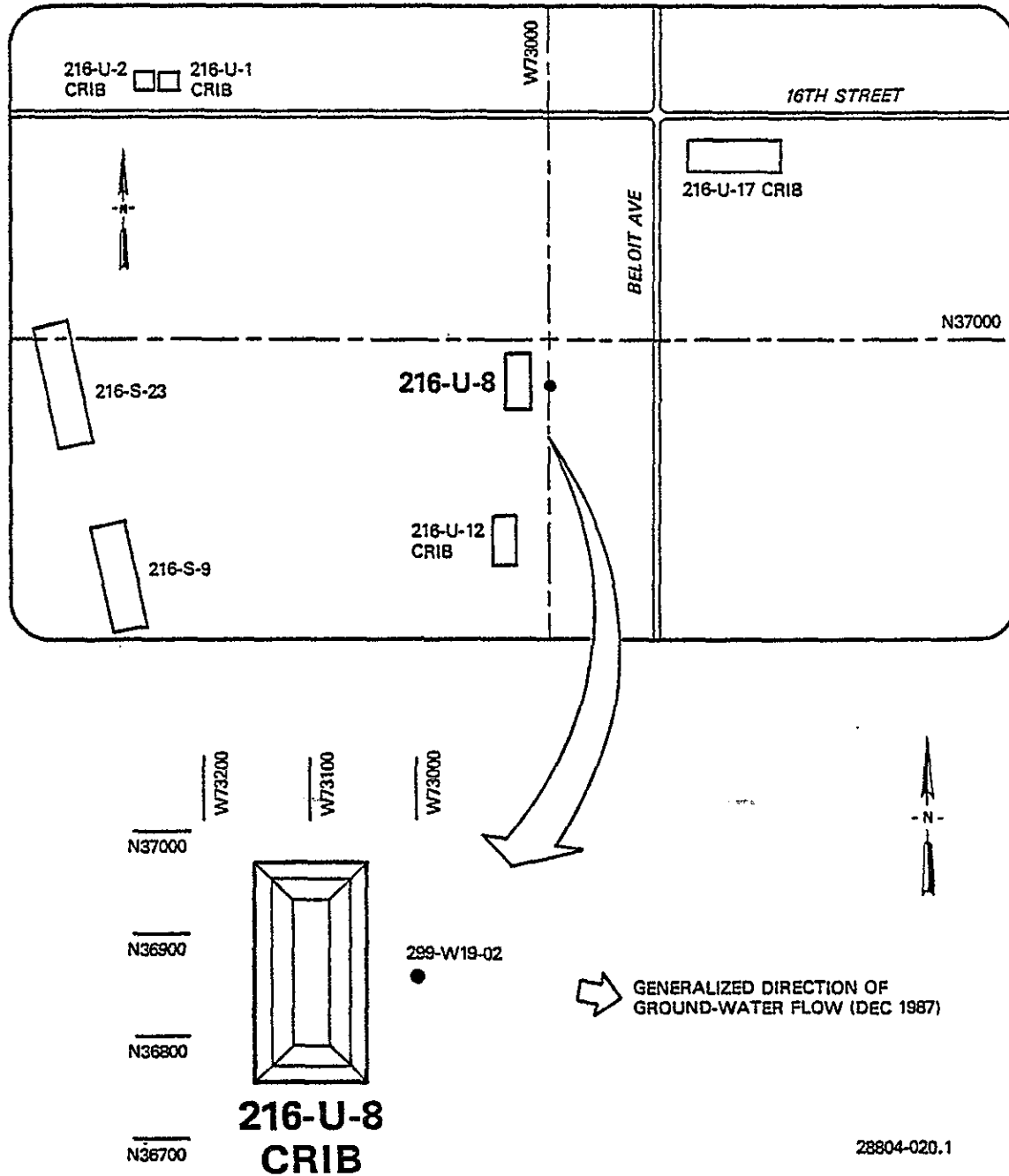
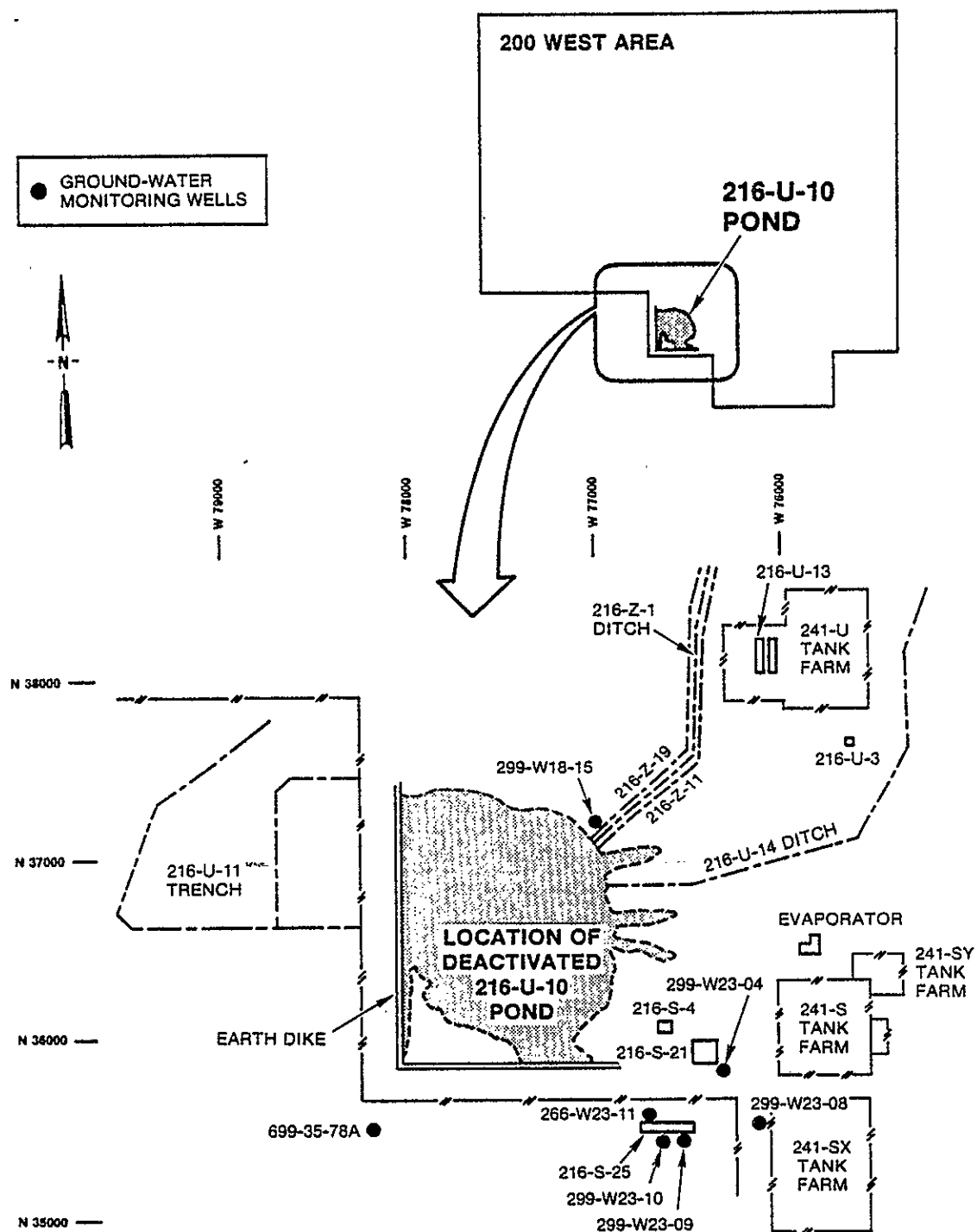


Figure A-19. Site Map of Inactive 216-U-8 Crib Showing Well Locations.



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Figure A-20. Site Map of Inactive 216-U-10 Pond Showing Well Locations.

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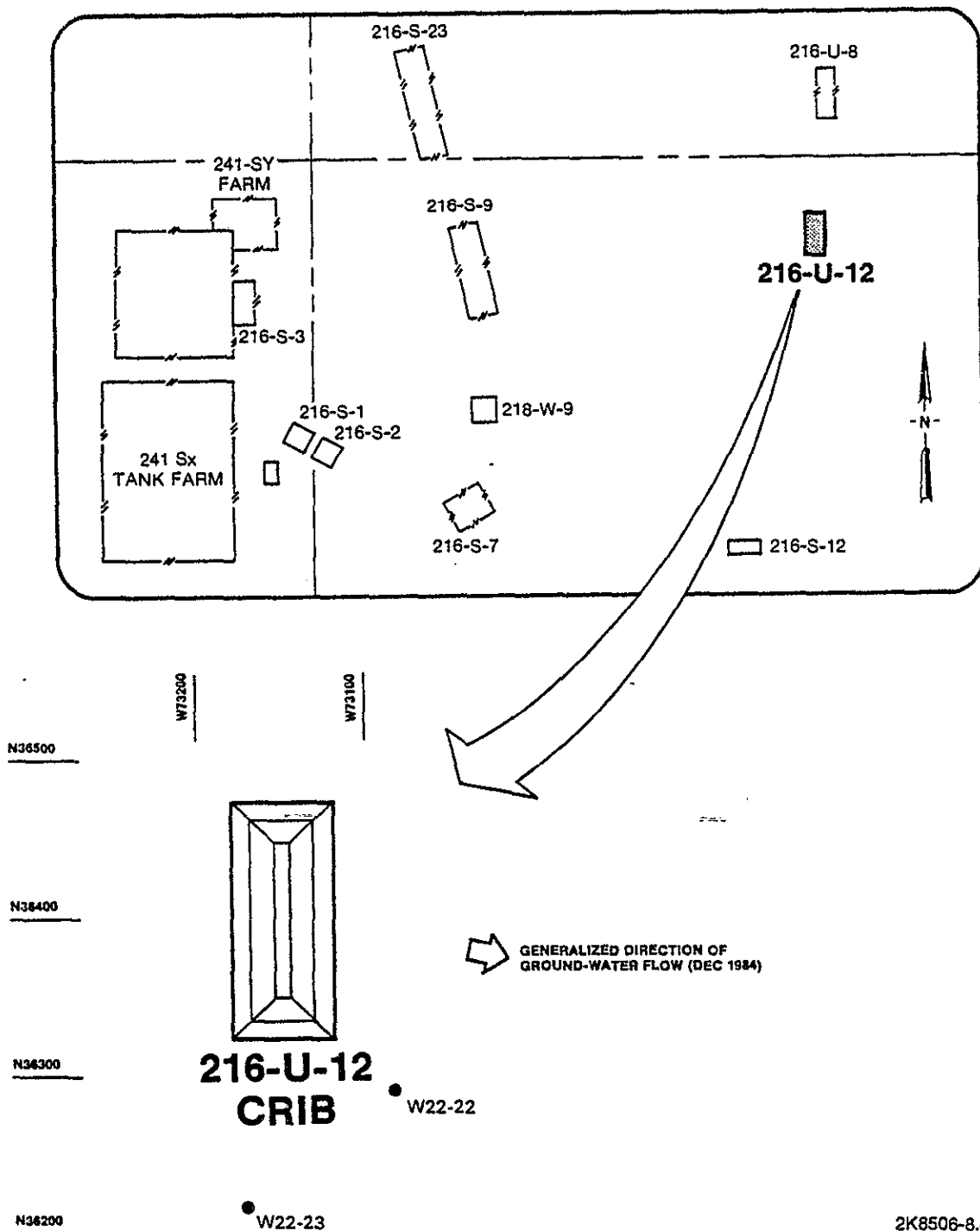


Figure A-21. Site Map of Active 216-U-12 Crib Showing Well Locations.

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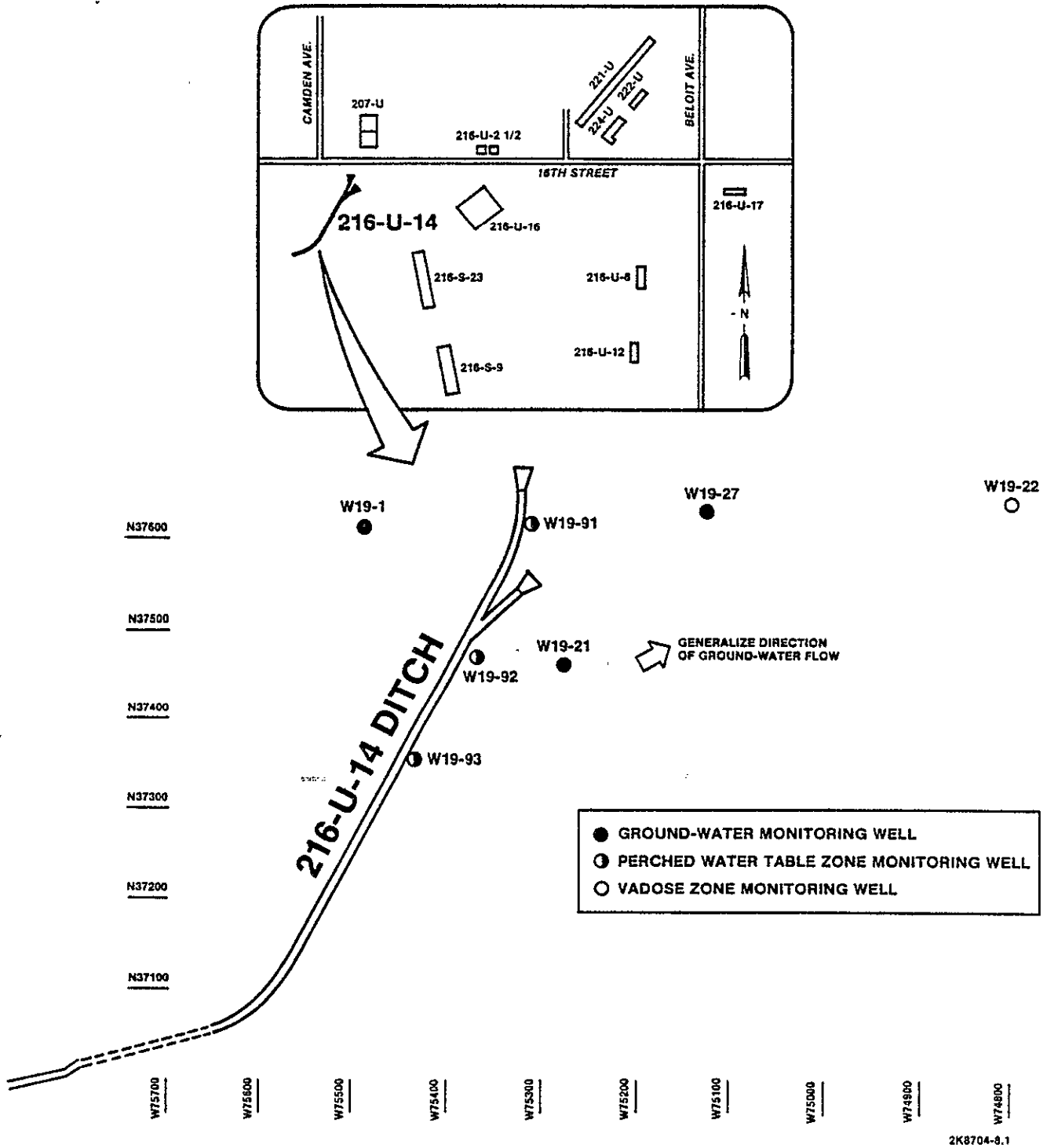


Figure A-22. Site Map of Active 216-U-14 Ditch Showing Well Locations.

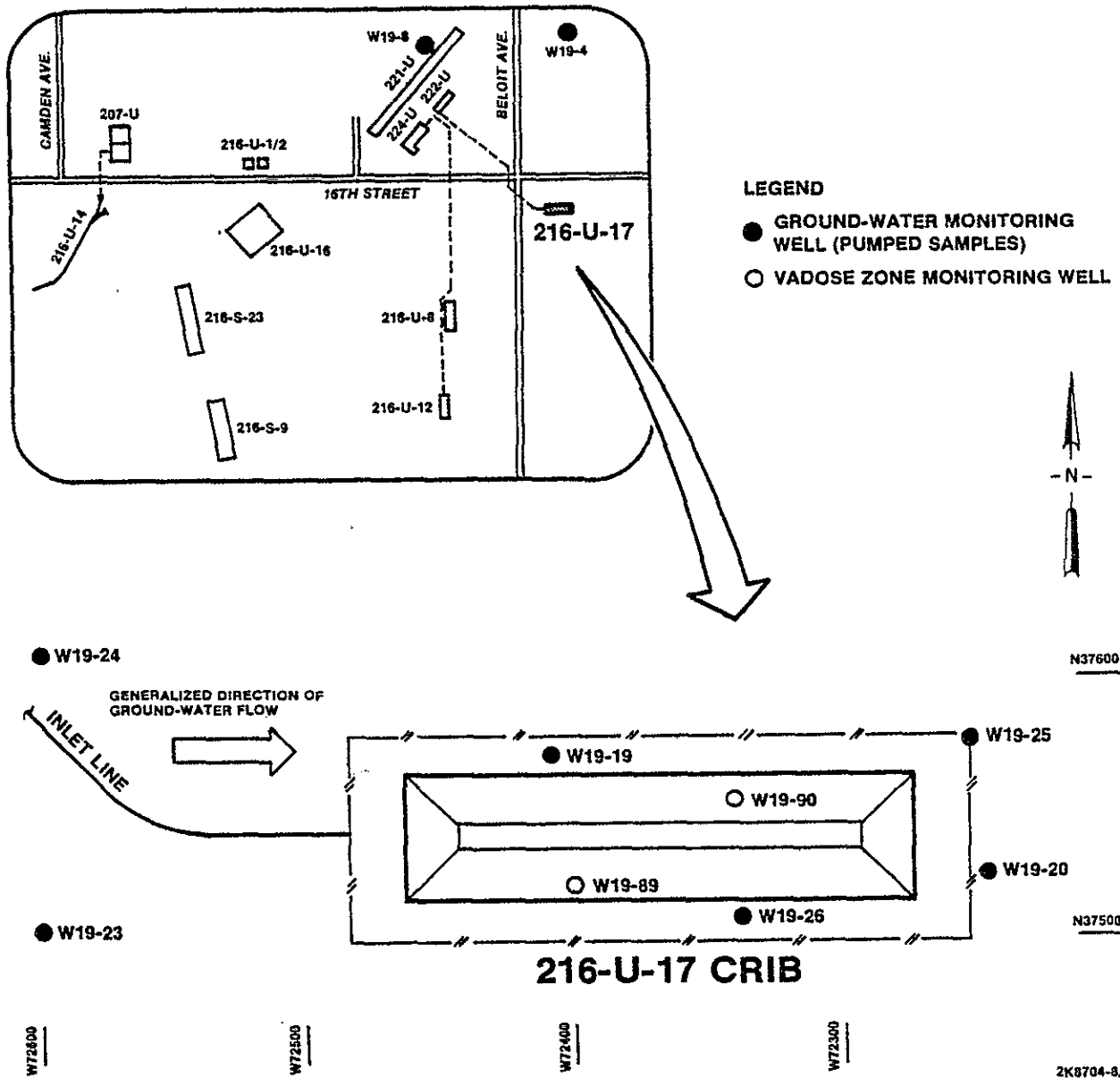
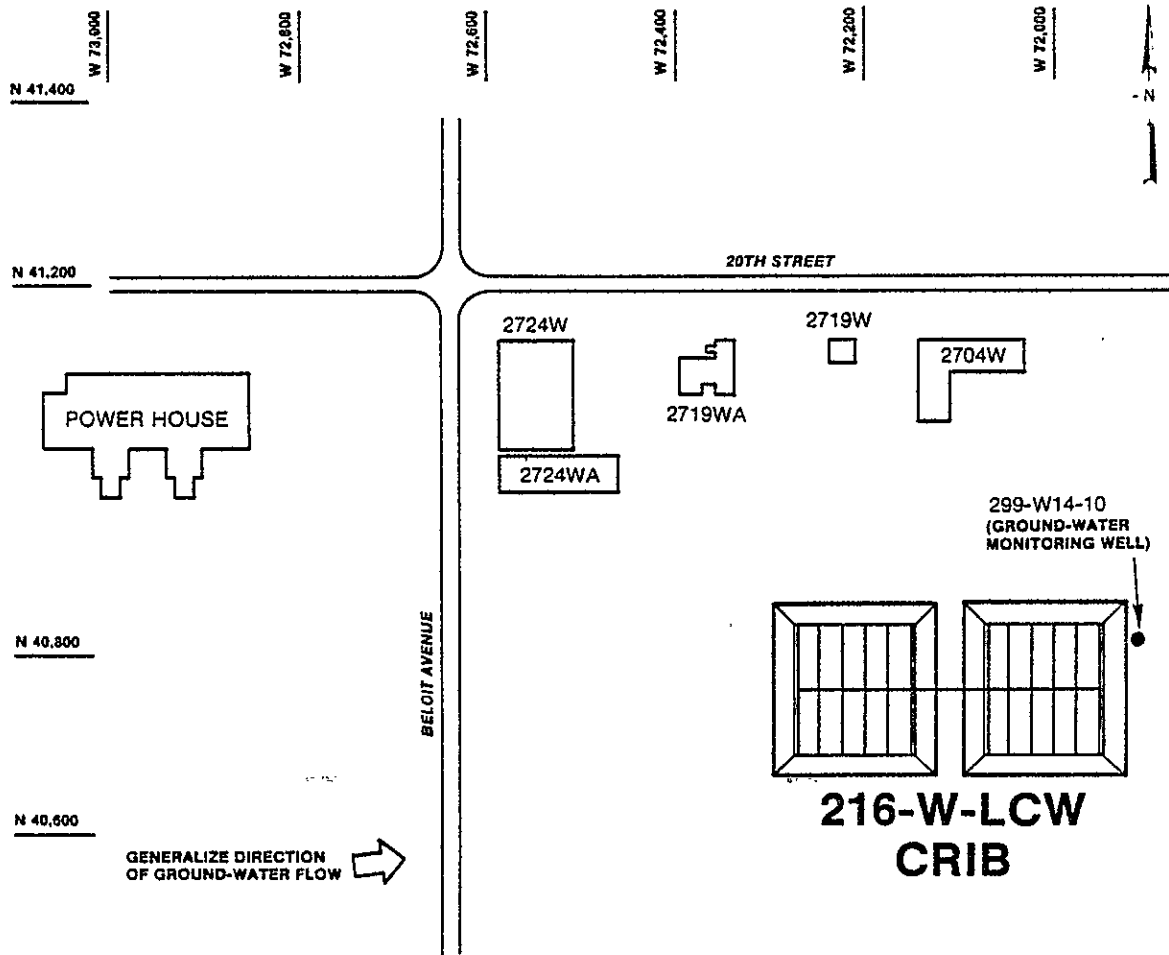


Figure A-23. Site Map of Active 216-U-17 Crib Showing Well Locations.



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Figure A-24. Site Map of Active 216-W-LWC Crib Showing Well Locations.

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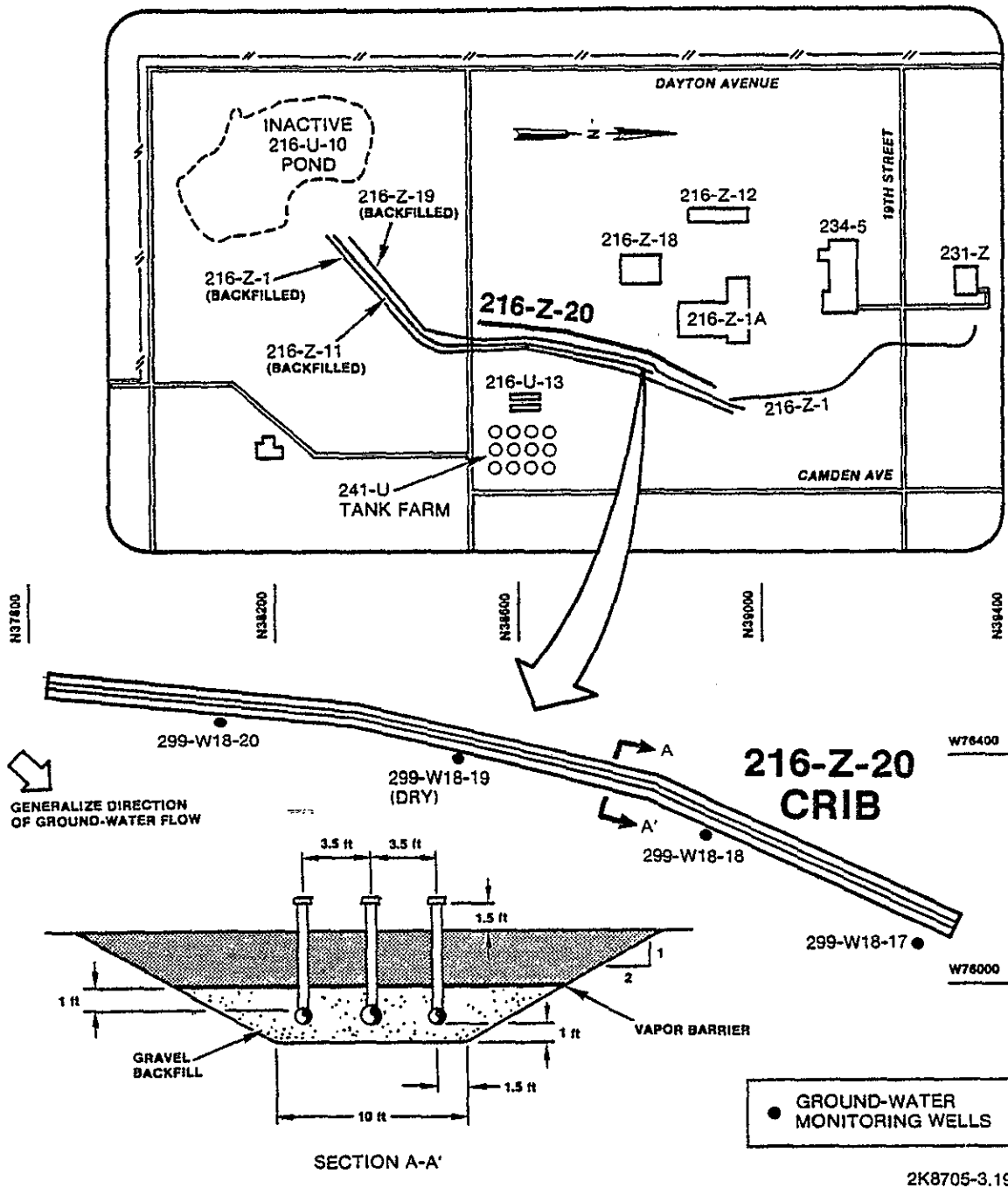


Figure A-25. Site Map of Active 216-Z-20 Crib Showing Well Locations.

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APPENDIX B

**RESULTS OF THE UNCONFINED AND CONFINED AQUIFER
GROUND-WATER MONITORING NETWORKS IN CY 1987**

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B.1	Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1987 ...	B-3
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B.4	Outliers that have been Deleted	B-21

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Table B-1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1987. (sheet 1 of 14)

Well no. (waste site)		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-E13-05 (216-B-18)*	MAX* AVG ^b MIN ^c	NN**	8.80E+00 7.30E+00 6.00E+00	7.63E+01 -3.78E+01 -1.58E+02	NN	NN	NN	NN	NN	NN
299-E13-08 (216-B-21)*	MAX AVG MIN	NN	7.50E+00 6.90E+00 6.10E+00	NN	4.20E+00 -2.58E+00 -1.28E+01	NN	4.71E+01 3.35E+00 -3.23E+01	3.44E+00 2.08E+00 0.00E+00	NN	NN
299-E13-14 (216-B-29)*	MAX AVG MIN	NN	6.70E+00 5.60E+00 4.40E+00	NN	NN	NN	NN	NN	NN	NN
299-E13-19 (216-B-28)*	MAX AVG MIN	NN	6.48E+00 5.88E+00 3.85E+00	NN	NN	NN	NN	NN	NN	NN
299-E16-02 (216-A-30)	MAX AVG MIN	2.30E+00 1.50E+00 9.00E-01	1.81E+01 1.29E+01 9.80E+00	8.45E+03 4.46E+03 1.81E+03	8.51E+00 5.00E-02 -8.12E+00	6.20E-01 1.90E-01 -2.30E-01	5.06E+01 -1.40E-01 -6.07E+01	8.21E+00 -7.80E-01 -1.10E+01	NN	7.02E+00 3.97E+00 1.36E+00
299-E17-01 (216-A-10)*	MAX AVG MIN	3.40E+00 2.70E+00 1.40E+00	3.29E+01 2.81E+01 2.37E+01	9.27E+06 8.02E+06 6.84E+06	9.72E+00 2.79E+00 -3.75E+00	6.94E+00 8.43E+00 5.91E+00	6.25E+01 4.90E+00 -3.25E+01	6.42E+00 1.29E+00 -5.98E+00	NN	4.17E+02 3.52E+02 2.46E+02
299-E17-02 (216-A-27)*	MAX AVG MIN	8.90E+00 7.00E+00 4.60E+00	5.70E+02 2.67E+02 8.93E+01	1.70E+05 7.19E+04 3.93E+04	3.96E+01 3.10E+01 1.75E+01	4.12E+00 3.55E+00 2.93E+00	4.12E+02 2.41E+02 1.37E+02	2.87E+00 -1.86E+00 -7.26E+00	6.65E+00 5.50E+00 4.75E+00	2.58E+02 1.53E+02 8.55E+01
299-E17-05 (216-A-36B)	MAX AVG MIN	8.90E+00 6.80E+00 5.80E+00	7.24E+02 2.09E+02 5.26E+01	5.39E+06 4.32E+06 3.89E+06	6.22E+01 1.63E+01 -9.11E+00	6.78E+00 3.78E+00 2.52E+00	5.67E+02 1.08E+02 -5.43E+01	7.94E+00 3.90E-01 -5.99E+00	7.27E+00 5.64E+00 4.01E+00	2.76E+02 1.40E+02 7.52E+01
299-E17-06 (200 EAST)	MAX AVG MIN	NN	1.94E+02 4.04E+01 6.90E+00	1.26E+05 3.42E+04 1.04E+02	NN	NN	NN	NN	NN	3.22E+00 1.69E+00 5.00E-01
299-E17-08 (216-A-10)*	MAX AVG MIN	NN	3.19E+01 1.99E+01 1.22E+01	8.29E+06 6.66E+06 4.52E+06	1.60E+00 2.00E-01 -2.53E+00	3.56E+00 2.95E+00 2.50E+00	3.25E+01 4.77E+00 -1.96E+01	9.99E+00 3.48E+00 0.00E+00	NN	3.58E+02 2.35E+02 6.70E+01
299-E17-09 (216-A-36B)	MAX AVG MIN	4.20E+00 3.10E+00 2.10E+00	3.40E+01 2.35E+01 1.42E+01	6.29E+06 5.10E+06 3.61E+06	5.61E+00 -1.40E+00 -1.07E+01	3.43E+00 3.19E+00 2.75E+00	1.12E+02 2.01E+01 -5.42E+01	8.55E+00 -1.11E+00 -1.59E+01	2.99E+00 2.44E+00 1.90E+00	1.70E+02 1.39E+02 1.14E+02

Table B-1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1987. (sheet 2 of 14)

Well no. (waste site)		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-E17-12 (216-A-45)	MAX	4.90E+00	4.56E+01	3.09E+06	8.55E+00	6.10E-01	8.28E+01	7.18E+00	4.01E+00	1.17E+02
	AVG	3.70E+00	2.57E+01	1.66E+06	-7.00E-02	6.00E-02	2.84E+01	-8.00E-01	2.89E+00	6.28E+01
	MIN	1.80E+00	1.48E+01	2.54E+05	-9.01E+00	-2.10E-01	-2.67E+01	-1.93E+01	1.70E+00	2.42E+01
299-E17-13 (216-A-45)	MAX	7.70E+00	3.89E+01	3.63E+06	8.41E+00	7.40E-01	5.91E+01	8.13E+00	5.64E+00	1.51E+02
	AVG	5.40E+00	2.43E+01	2.37E+06	1.34E+00	3.80E-01	-2.21E+01	9.00E-02	4.07E+00	9.11E+01
	MIN	3.10E+00	1.07E+01	1.14E+06	-1.12E+01	1.00E-01	-1.11E+02	-6.33E+00	3.06E+00	3.35E+01
299-E23-02 (200-EAST)*	MAX		7.80E+00	3.35E+04						2.50E+00
	AVG	NN	6.40E+00	2.97E+04	NN	NN	NN	NN	NN	1.50E+00
	MIN		5.10E+00	2.59E+04						5.00E-01
299-E24-01 (216-A-5)*	MAX		6.23E+01	1.13E+07	8.42E+00	1.63E+01	5.78E+01	3.85E+00		5.72E+02
	AVG	NN	4.29E+01	8.47E+06	1.82E+00	1.53E+01	1.34E+00	-3.18E+00	NN	3.88E+02
	MIN		3.15E+01	5.89E+06	-2.54E+00	1.43E+01	-2.34E+01	-9.40E+00		2.27E+02
299-E24-02 (216-A-10)*	MAX	6.50E+00	2.11E+01	4.85E+06	5.05E+00	3.34E+00	1.10E+02	3.33E+00		2.04E+02
	AVG	5.00E+00	1.79E+01	4.19E+06	-3.07E+00	2.40E+00	3.39E+01	-3.35E+00	NN	1.76E+02
	MIN	3.90E+00	1.41E+01	3.83E+06	-8.56E+00	1.42E+00	5.91E+00	-8.66E+00		1.49E+02
299-E24-04 (216-A-9)*	MAX		6.70E+00	3.75E+04	8.10E+00	4.60E-01	1.81E+01	2.14E+00		4.62E+00
	AVG	NN	4.70E+00	1.51E+04	-4.87E+00	3.50E-01	-3.26E+01	-2.80E-01	NN	3.33E+00
	MIN		2.60E+00	9.91E+03	-1.86E+01	2.30E-01	-1.06E+02	-1.89E+00		2.50E+00
299-E24-08 (216-C-3,4,5)*	MAX		4.80E+01	8.69E+03	2.28E+00		6.14E+01	2.41E+00		6.96E+00
	AVG	NN	2.28E+01	6.43E+03	4.40E-01	NN	-9.44E+00	-9.10E-01	NN	5.60E+00
	MIN		1.29E+01	4.63E+03	-5.60E-01		-8.44E+01	-4.82E+00		2.50E+00
299-E24-11 (216-A-10)*	MAX		3.95E+01	1.40E+07	5.61E+00	1.38E+00	3.96E+01	2.67E+00		4.70E+02
	AVG	NN	1.83E+01	9.09E+06	3.98E+00	1.09E+00	-1.01E+01	-1.73E+00	NN	3.18E+02
	MIN		1.02E+01	6.27E+06	5.40E-01	9.20E-01	-6.45E+01	-7.69E+00		2.28E+02
299-E24-12 (216-A-21,31)*	MAX		4.76E+02	2.49E+08	1.45E+01	4.31E+00	4.20E+02	2.27E+00		2.09E+02
	AVG	NN	1.08E+02	1.27E+08	1.06E+01	3.59E+00	1.23E+02	-1.52E+00	NN	8.73E+01
	MIN		2.17E+01	3.26E+05	7.31E+00	2.96E+00	-2.88E+01	-6.05E+00		4.66E+01
299-E24-13 (241-A)*	MAX		9.40E+00							4.21E+00
	AVG	NN	8.20E+00	NN	NN	NN	NN	NN	NN	3.14E+00
	MIN		6.90E+00							2.64E+00
299-E25-02 (216-A-1,7)*	MAX		4.40E+00	8.66E+03						2.50E+00
	AVG	NN	4.10E+00	7.92E+03	NN	NN	NN	NN	NN	2.08E+00
	MIN		3.80E+00	7.19E+03						1.65E+00

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Table B-1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1987. (sheet 3 of 14)

Well no. (waste site)		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-E25-03 (216-A-6)*	MAX AVG MIN	NN NN NN	5.20E+00 4.60E+00 4.00E+00	NN NN NN	NN NN NN	NN NN NN	NN NN NN	NN NN NN	NN NN NN	NN NN NN
299-E25-06 (216-A-8)	MAX AVG MIN	1.60E+00 1.10E+00 2.00E-01	8.70E+00 4.70E+00 1.10E+00	3.39E+04 1.10E+04 4.38E+03	4.21E+00 6.00E-02 -3.54E+00	3.30E-01 1.10E-01 -1.80E-01	4.51E+01 1.70E+01 -2.24E+01	5.56E+00 4.22E+00 2.66E+00	NN	3.29E+00 2.25E+00 1.53E+00
299-E25-09 (216-A-8)	MAX AVG MIN	1.60E+00 7.00E-01 1.00E-01	8.40E+00 5.00E+00 4.10E+00	4.32E+03 3.36E+03 2.36E+03	7.50E+00 3.07E+00 -1.52E+00	7.00E-01 3.60E-01 3.00E-02	3.53E+01 -7.97E+00 -8.21E+01	8.95E+00 2.14E+00 -2.56E+00	NN	2.50E+00 1.94E+00 1.34E+00
299-E25-10 (216-A-18,19)*	MAX AVG MIN	1.50E+00 1.30E+00 1.20E+00	6.90E+00 6.10E+00 5.10E+00	NN NN NN	2.43E+00 1.83E+00 1.22E+00	NN NN NN	5.50E+01 7.53E+00 -5.76E+01	3.03E+00 -3.27E+00 -7.94E+00	1.09E+00 1.09E+00 1.02E+00	NN NN NN
299-E25-11 (216-A-30)	MAX AVG MIN	1.80E+00 1.10E+00 5.00E-01	1.50E+01 1.11E+01 8.80E+00	6.02E+05 4.21E+05 2.93E+05	8.54E+00 -2.70E-01 -1.12E+01	2.61E+00 7.60E-01 2.00E-02	5.11E+01 -8.38E+00 -6.88E+01	8.99E+00 -3.20E-01 -1.31E+01	NN	5.50E+01 3.80E+01 2.80E+01
299-E25-13 (241-AX)*	MAX AVG MIN	NN NN NN	1.11E+01 9.70E+00 7.80E+00	NN NN NN	NN NN NN	NN NN NN	NN NN NN	NN NN NN	NN NN NN	4.43E+02 3.22E+02 1.28E+02
299-E25-17 (216-A-37-1)	MAX AVG MIN	1.50E+00 1.10E+00 1.00E-01	1.78E+01 1.03E+01 8.30E+00	5.02E+05 3.64E+05 1.79E+05	-1.70E+00 -6.45E+00 -1.50E+01	1.22E+00 5.80E-01 -2.30E-01	3.98E+01 -2.95E+00 -3.11E+01	5.00E+00 2.17E+00 -6.70E-01	NN	2.65E+01 1.64E+01 7.75E+00
299-E25-18 (216-A-37-1)	MAX AVG MIN	1.80E+00 1.30E+00 1.00E+00	1.17E+01 7.50E+00 4.40E+00	3.12E+05 1.71E+05 6.70E+04	7.93E+00 -7.90E-01 -1.17E+01	2.34E+00 6.70E-01 5.00E-02	5.38E+01 1.25E+01 -5.34E+01	8.33E+00 1.27E+00 -7.03E+00	NN	2.67E+01 1.63E+01 9.55E+00
299-E25-19 (216-A-37-1)	MAX AVG MIN	1.70E+00 1.10E+00 4.00E-01	1.19E+02 5.44E+01 9.30E+00	6.83E+06 3.97E+06 4.23E+05	6.09E+00 1.77E+00 -3.56E+00	4.10E-01 -4.00E-02 -6.30E-01	1.46E+01 -4.00E+01 -1.23E+02	6.81E+00 4.13E+00 3.20E-01	NN	2.57E+02 1.67E+02 6.27E+01
299-E25-20 (216-A-37-1)	MAX AVG MIN	2.40E+00 1.80E+00 1.20E+00	1.78E+01 1.37E+01 9.20E+00	8.58E+05 6.08E+05 2.86E+05	5.61E+00 6.20E-01 -5.35E+00	1.60E-01 7.00E-02 -1.30E-01	8.67E+01 3.71E+01 1.41E+01	8.55E+00 3.98E+00 -6.70E-01	NN	2.29E+02 1.70E+02 1.32E+02
299-E25-21 (216-A-37-2)	MAX AVG MIN	2.30E+00 1.60E+00 9.00E-01	1.47E+01 1.12E+01 9.00E+00	9.09E+03 4.72E+03 2.45E+03	9.84E+00 1.84E+00 -9.12E+00	9.60E-01 2.90E-01 -1.60E-01	5.07E+01 -1.22E+01 -9.40E+01	5.55E+00 -1.00E+00 -1.09E+01	NN	1.24E+01 9.01E+00 5.72E+00

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Table B-1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1987. (sheet 4 of 14)

Well no. (waste site)		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-E25-22 (216-A-37-2)	MAX	1.50E+00	1.09E+01	1.34E+04	9.74E+00	8.40E-01	8.99E+01	1.02E+01	NN	7.04E+00
	AVG	1.00E+00	6.20E+00	6.94E+03	-2.08E+00	4.00E-01	-1.88E+00	1.29E+00		5.27E+00
	MIN	8.00E-01	3.50E+00	4.87E+03	-1.02E+01	3.00E-02	-1.44E+02	-1.12E+01		4.30E+00
299-E25-23 (216-A-37-2)	MAX	1.50E+00	1.89E+01	1.59E+03	4.05E+00	1.50E-01	9.55E+01	8.48E+00	NN	4.03E+00
	AVG	1.00E+00	1.49E+01	6.09E+02	-6.30E-01	1.00E-02	3.39E+01	1.81E+00		2.88E+00
	MIN	7.00E-01	1.32E+01	1.71E+02	-6.42E+00	-1.40E-01	2.83E+00	-4.48E+00		2.30E+00
299-E25-24 (216-A-37-2)	MAX	1.30E+00	2.22E+01	3.15E+03	1.12E+01	2.90E-01	9.04E+01	1.07E+01	NN	5.30E+00
	AVG	1.00E+00	1.50E+01	1.06E+03	3.66E+00	1.50E-01	1.62E+01	-2.80E-01		3.14E+00
	MIN	7.00E-01	8.10E+00	4.90E+02	-4.29E+00	3.00E-02	-4.08E+01	-7.89E+00		2.50E+00
299-E26-02 (216-A-24)*	MAX		6.50E+00	3.40E+03					NN	3.40E+00
	AVG	NN	5.50E+00	2.76E+03	NN	NN	NN	NN		2.38E+00
	MIN		4.60E+00	2.34E+03						1.14E+00
299-E26-04 (216-A-24)*	MAX		6.40E+00	6.74E+04					NN	3.71E+00
	AVG	NN	5.40E+00	4.90E+04	NN	NN	NN	NN		2.60E+00
	MIN		4.70E+00	3.68E+04						1.68E+00
299-E26-06 (401-A)*	MAX	9.00E-01	5.30E+00	3.64E+03	5.34E+00	8.40E-01	2.23E+01	4.00E+00	NN	2.50E+00
	AVG	6.00E-01	3.60E+00	1.38E+03	9.50E-01	4.80E-01	-4.43E+01	-1.87E+00		2.05E+00
	MIN	3.00E-01	2.00E+00	1.35E+02	-6.34E+00	2.60E-01	-8.40E+01	-5.99E+00		6.87E-01
299-E27-05 (216-C-10)*	MAX		8.67E+01		9.74E+00		2.23E+01	1.20E+01	NN	NN
	AVG	NN	6.85E+01	NN	3.77E+00	NN	-1.31E+01	3.11E+00		
	MIN		5.33E+01		-1.69E+00		-8.16E+01	-1.37E+00		
299-E27-07 (241-C)*	MAX	1.69E+00	7.53E+00						NN	1.07E+01
	AVG	1.57E+00	5.97E+00	NN	NN	NN	NN	NN		5.48E+00
	MIN	1.46E+00	3.88E+00							2.50E+00
299-E28-07 (216-B-5)*	MAX	1.60E+00	2.96E+02		6.79E+00	1.45E+02	8.83E+00	3.20E+00	1.29E+00	NN
	AVG	1.10E+00	1.92E+02	NN	1.50E+00	9.40E+01	-4.40E+01	-1.73E+00	1.15E+00	
	MIN	8.00E-01	1.12E+02		-3.64E+00	6.93E+01	-9.22E+01	-7.67E+00	1.02E+00	
299-E28-09 (216-B-12)*	MAX	1.02E+01	1.15E+01						8.62E+00	NN
	AVG	8.40E+00	1.00E+01	NN	NN	NN	NN	NN	6.65E+00	
	MIN	6.20E+00	8.70E+00						4.48E+00	
299-E28-12 (216-B-55)	MAX		2.04E+01	4.01E+05	6.09E+00		4.87E+01	7.18E+00	NN	NN
	AVG	NN	1.54E+01	1.46E+05	-1.00E+00	NN	-2.55E+00	1.40E-01		
	MIN		9.40E+00	7.02E+04	-1.64E+01		-3.85E+01	-6.89E+00		

Table B-1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1987. (sheet 5 of 14)

Well no. (waste site)		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-E28-13 (216-B-55)	MAX AVG MIN	NN	9.50E+00 8.20E+00 7.00E+00	8.98E+03 6.70E+03 5.30E+03	4.51E+00 1.91E+00 1.01E+00	NN	4.65E+01 -3.11E+00 -5.35E+01	5.98E+00 2.80E+00 -1.59E+00	NN	NN
299-E28-16 (216-B-12)*	MAX AVG MIN	8.20E+00 7.10E+00 6.40E+00	1.10E+01 8.20E+00 7.00E+00	NN	NN	NN	NN	NN	7.88E+00 6.04E+00 4.62E+00	NN
299-E28-17 (216-B-6,10B)*	MAX AVG MIN	6.80E+00 5.80E+00 4.00E+00	8.90E+00 8.90E+00 8.90E+00	NN	NN	NN	NN	NN	8.22E+00 6.18E+00 4.01E+00	NN
299-E28-18 (216-B-62)	MAX AVG MIN	9.41E+01 5.51E+01 3.66E+01	2.88E+01 1.91E+01 1.46E+01	1.19E+04 7.98E+03 5.13E+03	7.01E+00 2.40E+00 -9.13E+00	9.40E-01 3.80E-01 5.00E-02	4.38E+01 -3.87E+00 -4.03E+01	5.67E+00 -3.10E-01 -1.67E+01	8.22E+01 4.98E+01 3.48E+01	7.33E+01 5.13E+01 3.61E+01
299-E28-21 (216-B-82)	MAX AVG MIN	5.57E+01 4.54E+01 3.05E+01	1.95E+01 1.54E+01 1.03E+01	9.59E+03 8.85E+03 4.80E+03	9.73E+00 3.04E+00 -7.98E+00	1.19E+00 5.10E-01 1.10E-01	6.98E+01 -3.60E+00 -8.34E+01	7.18E+00 7.30E-01 -1.07E+01	5.38E+01 4.34E+01 3.00E+01	4.47E+01 4.04E+01 3.07E+01
299-E28-23 (216-B-5)*	MAX AVG MIN	5.72E+01 3.30E+01 1.18E+01	1.57E+04 1.24E+04 1.01E+04	7.43E+03 6.29E+03 5.53E+03	6.94E+01 1.68E+01 -2.44E+00	7.80E+03 6.10E+03 4.04E+03	6.11E+01 -5.35E+01 -3.12E+02	2.49E+03 1.88E+03 1.58E+03	3.60E+01 2.64E+01 2.32E+01	1.14E+01 1.02E+01 9.27E+00
299-E28-24 (216-B-5)*	MAX AVG MIN	6.00E-01 3.00E-01 2.00E-01	3.81E+02 2.99E+02 2.01E+02	NN	1.22E+01 6.30E-01 -1.13E+01	1.92E+02 1.89E+02 1.86E+02	2.24E+01 1.07E+01 2.79E+00	9.85E+00 4.53E+00 -3.00E+00	4.75E-01 2.72E-01 1.36E-01	NN
299-E28-25 (216-B-5)*	MAX AVG MIN	9.00E+00 6.90E+00 3.40E+00	8.83E+03 6.10E+03 4.37E+03	NN	6.73E+00 2.60E+00 -5.46E+00	3.49E+03 3.15E+03 2.73E+03	3.52E+01 -2.50E+01 -1.03E+02	4.75E+01 3.61E+01 1.90E+01	4.96E+00 3.67E+00 2.44E+00	NN
299-E32-01 (LLBG)*	MAX AVG MIN	NN	3.75E+01 3.67E+01 3.59E+01	7.56E+03 6.80E+03 6.04E+03	NN	NN	NN	NN	NN	1.07E+01 5.60E+00 5.04E-01
299-E33-01 (216-B-43)*	MAX AVG MIN	NN	1.40E+02 1.02E+02 6.35E+01	NN	1.93E+01 1.03E+01 2.67E+00	5.80E-01 2.30E-01 5.00E-02	3.96E+01 2.18E+00 -5.18E+01	3.78E+00 -8.50E-01 -2.33E+00	NN	NN
299-E33-03 (216-B-44,45)*	MAX AVG MIN	NN	4.38E+02 1.68E+02 2.99E+01	1.69E+03 9.19E+02 3.09E+02	2.41E+01 1.06E+01 1.07E+00	5.10E-01 4.80E-01 4.50E-01	4.86E+01 -8.70E-01 -1.01E+02	5.11E+00 2.02E+00 -1.71E+00	NN	NN

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Table B-1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1987. (sheet 6 of 14)

Well no. (waste site)		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-E33-05 (216-B-47)*	MAX AVG MIN	NN	2.93E+02 2.47E+02 1.98E+02	NN	3.08E+01 2.14E+01 1.39E+01	8.30E-01 4.50E-01 7.00E-02	7.18E+00 -3.75E+01 -1.44E+02	4.82E+00 -1.99E+00 -1.03E+01	NN	NN
299-E33-07 (216-B-48,49)*	MAX AVG MIN	NN	1.01E+03 7.38E+02 6.53E+02	NN	7.69E+01 5.78E+01 3.93E+01	4.03E+01 1.02E+01 -4.60E-01	6.04E+01 9.63E+00 -3.23E+01	1.34E+01 -2.77E+00 -1.51E+01	NN	NN
299-E33-08 (216-B-41)*	MAX AVG MIN	NN	1.09E+02 7.35E+01 5.72E+01	NN	8.44E+00 2.93E+00 -4.88E+00	6.60E-01 3.50E-01 6.00E-02	5.99E+01 2.06E+01 -1.72E+01	5.51E+00 2.08E+00 -8.50E-01	NN	NN
299-E33-09 (241-BY)*	MAX AVG MIN	NN	2.26E+02 2.00E+02 1.30E+02	3.82E+03 2.49E+03 1.62E+03	1.06E+00 -1.39E+00 -2.82E+00	2.01E+00 1.40E+00 1.09E+00	3.83E+01 -1.61E+01 -9.70E+01	1.20E+01 6.13E+00 -5.34E+00	NN	1.02E+01 7.70E+00 1.66E+00
299-E33-10 (216-B-35,41)*	MAX AVG MIN	NN	2.77E+01 1.91E+01 1.16E+01	4.38E+03 3.51E+03 3.04E+03	4.52E+00 1.66E+00 -1.52E+00	-3.00E-02 -7.00E-02 -1.10E-01	4.59E+01 1.26E+01 -2.82E+01	4.92E+00 1.69E+00 -1.28E+00	NN	1.05E+01 7.14E+00 5.73E+00
299-E33-18 (216-B-7A,7B)*	MAX AVG MIN	NN	1.08E+01 9.70E+00 8.60E+00	NN	2.81E+00 6.60E-01 -1.83E+00	2.41E+00 1.54E+00 6.70E-01	4.77E+01 -1.26E+01 -5.79E+01	3.02E+00 -1.04E+00 -4.45E+00	NN	NN
299-E33-20 (216-B-7,11)*	MAX AVG MIN	NN	1.38E+01 1.08E+01 8.40E+00	NN	NN	2.00E+00 1.37E+00 7.40E-01	NN	NN	NN	9.73E+00 5.21E+00 2.74E+00
299-E33-21 (216-B-36)*	MAX AVG MIN	NN	1.27E+01 9.50E+00 6.00E+00	NN	5.08E+00 2.20E-01 -7.46E+00	NN	4.92E+01 2.08E+01 -1.27E+01	4.99E+00 -1.40E-01 -1.13E+01	NN	NN
299-E33-24 (216-B-57)*	MAX AVG MIN	NN	3.86E+02 2.97E+02 2.16E+02	NN	7.07E+00 3.41E+00 -4.87E+00	9.40E-01 4.40E-01 -2.00E-02	5.02E+01 3.00E+01 3.15E+00	5.64E+00 1.15E+00 -2.65E+00	NN	NN
299-E33-26 (216-B-61)*	MAX AVG MIN	NN	2.71E+02 2.24E+02 1.97E+02	NN	1.92E+01 1.18E+01 4.57E+00	6.10E-01 4.30E-01 1.90E-01	6.79E+01 4.18E+01 1.95E+01	1.99E+00 -1.85E+00 -6.40E+00	NN	NN
299-E34-01 (216-B-63)	MAX AVG MIN	2.90E+00 2.30E+00 1.40E+00	1.21E+01 9.50E+00 7.60E+00	1.34E+03 7.84E+02 2.54E+02	6.83E+00 1.80E+00 -1.08E+01	NN	7.21E+01 2.56E+00 -5.78E+01	9.96E+00 3.90E-01 -6.04E+00	NN	NN

9 2 1 2 5 0 0 0 9 0 5

Table B-1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1987. (sheet 7 of 14)

Well no. (waste site)		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-W10-01 (216-T-5)*	MAX		4.04E+01		9.10E+00	2.30E-01	4.40E+01	2.24E+00		4.25E+02
	AVG	NN	3.44E+01	NN	5.06E+00	-1.20E-01	9.06E+00	-3.18E+00	NN	4.25E+02
	MIN		2.98E+01		1.53E+00	-5.00E-01	-1.38E+01	-1.77E+01		4.25E+02
299-W10-03 (216-T-32)*	MAX	2.92E+01	4.71E+01		1.10E+01	5.30E-01	1.85E+01	5.56E+00		
	AVG	1.72E+01	4.03E+01	NN	4.34E+00	2.20E-01	-1.63E+01	2.22E+00	NN	NN
	MIN	1.12E+01	3.38E+01		-2.10E+00	-4.00E-02	-4.51E+01	-2.12E+00		
299-W10-04 (216-T-36)*	MAX		6.16E+01		1.59E+01	1.83E+00	4.72E+01	4.27E+00		
	AVG	NN	5.74E+01	NN	1.29E+01	8.70E-01	-4.25E+00	-2.03E+00	NN	NN
	MIN		5.08E+01		9.83E+00	-9.00E-02	-5.57E+01	-8.32E+00		
299-W10-08 (241-T)*	MAX	2.20E+00	1.13E+01		1.61E+00	1.35E+00	2.59E+01	2.33E+00		7.61E+00
	AVG	1.80E+00	5.50E+00	NN	-2.55E+00	4.80E-01	9.66E+00	-1.55E+00	NN	4.17E+00
	MIN	1.10E+00	2.60E+00		-4.82E+00	7.00E-02	-5.65E+00	-4.92E+00		2.50E+00
299-W10-09 (241-T)*	MAX	2.80E+00	5.07E+01		1.36E+01	4.60E-01	5.53E+01	-3.30E-01		3.97E+02
	AVG	2.40E+00	4.42E+01	NN	8.17E+00	2.10E-01	5.01E+00	-3.58E+00	NN	3.67E+02
	MIN	1.60E+00	3.41E+01		-1.62E+00	-6.00E-02	-4.46E+01	-1.17E+01		3.11E+02
299-W11-11 (216-T-18)*	MAX	2.50E+00	5.57E+01		1.89E+01	4.40E-01	4.47E+01	3.78E+00		
	AVG	1.90E+00	4.94E+01	NN	8.16E+00	7.00E-02	1.13E+01	-1.57E+00	NN	NN
	MIN	1.50E+00	4.34E+01		0.00E+00	-9.00E-02	-2.32E+01	-8.05E+00		
299-W11-15 (216-T-32)*	MAX		2.14E+01							
	AVG	NN	1.98E+01	NN	NN	NN	NN	NN	NN	NN
	MIN		1.87E+01							
299-W11-18 (216-T-35)*	MAX		5.52E+01		1.42E+01	8.10E-01	3.36E+01	5.26E+00		
	AVG	NN	5.10E+01	NN	7.22E+00	5.00E-01	1.04E+01	-2.69E+00	NN	NN
	MIN		4.76E+01		-5.89E+00	1.80E-01	-2.52E+01	-1.07E+01		
299-W11-23 (241-T)*	MAX	3.60E+00	4.62E+01		1.39E+01	2.60E-01	4.47E+01	3.00E+00		4.51E+02
	AVG	2.50E+00	3.39E+01	NN	6.58E+00	4.00E-02	-1.78E+01	1.51E+00	NN	4.34E+02
	MIN	9.00E-01	2.05E+01		-2.44E+00	-1.50E-01	-6.96E+01	-7.60E-01		4.08E+02
299-W11-24 (241-T)*	MAX	1.10E+00	5.62E+01		5.35E+00	9.40E-01	1.13E+01	6.99E+00		3.33E+02
	AVG	7.00E-01	2.07E+01	NN	-2.90E+00	2.70E-01	1.50E-01	1.26E+00	NN	2.85E+02
	MIN	3.00E-01	8.50E+00		-1.16E+01	3.00E-02	-1.64E+01	-5.30E+00		2.21E+02
299-W14-02 (216-T-26,27)*	MAX	1.40E+00	6.53E+01	1.16E+05	3.75E+00	1.65E+00	4.18E+01	6.35E+00		
	AVG	1.30E+00	5.81E+01	1.01E+05	1.30E-01	1.20E+00	2.34E+01	-7.00E-01	NN	NN
	MIN	1.10E+00	4.52E+01	8.88E+04	-4.04E+00	7.50E-01	2.82E+00	-6.43E+00		

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Table B-1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1987. (sheet 8 of 14)

Well no. (waste site)		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-W14-05 (241-TX)*	MAX		2.81E+01	1.87E+04						1.40E+02
	AVG	NN	2.54E+01	9.85E+03	NN	NN	NN	NN	NN	7.84E+01
	MIN		2.34E+01	6.21E+03						2.89E+01
299-W14-06 (241-TX)*	MAX		2.80E+01	5.37E+04						8.91E+01
	AVG	NN	1.58E+01	3.27E+04	NN	NN	NN	NN	NN	4.65E+01
	MIN		1.01E+01	1.65E+04						2.01E+01
299-W14-10 (216-W-LWC)	MAX	7.30E+00	9.70E+00	2.41E+03	7.11E+00	3.80E-01	4.09E+01	4.00E+00		1.03E+02
	AVG	4.10E+00	6.40E+00	1.48E+03	2.00E+00	1.20E-01	-2.21E+01	-1.61E+00	NN	8.93E+01
	MIN	1.30E+00	4.70E+00	2.48E+02	-5.80E+00	1.00E-02	-7.85E+01	-9.00E+00		6.42E+01
299-W15-03 (241-TY)*	MAX		8.83E+01		6.86E+00	1.00E-01	-5.92E+00	2.49E+00		1.45E+02
	AVG	NN	8.10E+01	NN	6.26E+00	2.00E-02	-7.58E+00	2.45E+00	NN	1.34E+02
	MIN		7.32E+01		5.66E+00	-7.00E-02	-9.24E+00	2.41E+00		1.24E+02
299-W15-04 (216-T-19)*	MAX		1.30E+01	2.61E+05						7.07E+02
	AVG	NN	1.17E+01	2.20E+05	NN	NN	NN	NN	NN	6.17E+02
	MIN		1.05E+01	1.64E+05						5.20E+02
299-W15-06 (216-Z-9)*	MAX	9.00E-01	5.10E+00							1.20E+01
	AVG	8.00E-01	4.40E+00	NN	NN	NN	NN	NN	NN	1.03E+01
	MIN	8.00E-01	4.00E+00							8.68E+00
299-W15-07 (216-Z-7)*	MAX	8.00E-01	2.38E+01		1.90E+01	8.00E-01	4.35E+01	-9.83E+00		5.49E+01
	AVG	8.00E-01	2.38E+01	NN	1.90E+01	8.00E-01	4.35E+01	-9.83E+00	NN	5.49E+01
	MIN	8.00E-01	2.38E+01		1.90E+01	8.00E-01	4.35E+01	-9.83E+00		5.49E+01
299-W15-10 (216-Z-16)*	MAX	1.40E+00	2.16E+01							1.07E+02
	AVG	1.20E+00	1.90E+01	NN	NN	NN	NN	NN	NN	1.03E+02
	MIN	1.10E+00	1.63E+01							1.00E+02
299-W15-11 (216-Z-16)*	MAX	2.60E+00	1.60E+01		5.61E+00	2.30E-01	5.91E+01	8.78E+00		1.52E+02
	AVG	2.30E+00	1.47E+01	NN	2.89E+00	4.00E-02	2.03E+01	5.91E+00	NN	1.37E+02
	MIN	2.20E+00	1.18E+01		6.10E-01	-2.20E-01	-6.11E+01	3.42E+00		1.21E+02
299-W18-05 (216-Z-12)*	MAX	8.00E-01	9.30E+00							
	AVG	6.00E-01	7.20E+00	NN	NN	NN	NN	NN	NN	NN
	MIN	1.00E-01	3.90E+00							
299-W18-09 (216-Z-18)*	MAX	1.40E+00	8.60E+00							6.90E+00
	AVG	6.00E-01	4.60E+00	NN	NN	NN	NN	NN	NN	6.20E+00
	MIN	1.00E-01	1.80E+00							5.20E+00

Table B-1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1987. (sheet 9 of 14)

Well no. (waste site)		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-W18-15 (216-U-10)*	MAX	8.03E+01	2.93E+01	3.35E+02	3.21E+00	NN	5.06E+01	2.33E+00	5.19E+01	2.78E+00
	AVG	5.30E+01	1.75E+01	1.41E+02	-1.27E+00		-1.57E+00	1.10E-01	4.81E+01	1.87E+00
	MIN	4.12E+01	1.00E+01	-4.86E+01	-4.57E+00		-2.30E+01	-2.33E+00	3.99E+01	5.41E-01
299-W18-17 (216-Z-20)	MAX	1.40E+00	6.10E+00	7.63E+02	7.02E+00	NN	6.12E+01	2.86E+00	NN	8.03E+00
	AVG	3.00E-01	4.10E+00	3.44E+02	1.69E+00		1.74E+01	-6.00E-02		5.58E+00
	MIN	-2.00E-01	2.30E+00	8.70E+01	-6.31E+00		-2.16E+01	-2.99E+00		2.50E+00
299-W18-18 (216-Z-20)	MAX	1.40E+00	4.40E+00	2.33E+02	6.43E+00	NN	4.37E+01	2.14E+00	NN	3.01E+00
	AVG	6.00E-01	3.10E+00	7.77E+01	2.00E+00		2.00E+00	2.90E-01		1.06E+00
	MIN	0.00E+00	2.50E+00	-7.89E+01	-6.07E+00		-7.21E+01	-2.65E+00		5.00E-01
299-W18-20 (216-Z-20)	MAX	2.30E+00	6.10E+00	1.69E+03	2.14E+00	NN	3.35E+01	9.33E+00	NN	3.88E+00
	AVG	1.00E+00	4.70E+00	5.40E+02	-4.24E+00		-9.43E+00	3.70E-01		3.01E+00
	MIN	4.00E-01	3.70E+00	1.29E+01	-1.09E+01		-6.53E+01	-1.62E+01		2.50E+00
299-W19-02 (216-U-8)*	MAX	9.14E+01	1.28E+02	1.29E+05	2.29E+00	1.74E+01	2.91E+00	5.98E+00	6.42E+01	5.85E+02
	AVG	5.34E+01	9.72E+01	1.08E+05	-2.03E+00	1.38E+01	-4.22E+01	7.30E-01	4.16E+01	4.60E+02
	MIN	1.69E+01	6.98E+01	6.99E+04	-7.02E+00	1.06E+01	-9.42E+01	-8.26E+00	1.58E+01	3.17E+02
299-W19-03 (216-U-1,2)*	MAX	1.05E+04	1.01E+04	1.99E+03	2.88E+01	6.34E+00	4.23E+01	8.12E+00	1.13E+04	1.13E+02
	AVG	7.29E+03	6.88E+03	1.41E+03	2.82E+00	2.80E+00	1.44E+00	4.60E-01	7.40E+03	9.96E+01
	MIN	3.93E+03	4.05E+03	9.21E+02	-1.52E+01	3.90E-01	-2.18E+01	-5.23E+00	3.89E+03	7.14E+01
299-W19-05 (216-S-23)*	MAX	8.70E+00	3.03E+01	6.43E+02	NN	NN	NN	NN	8.01E+00	5.52E+00
	AVG	8.70E+00	2.54E+01	4.04E+02					8.01E+00	4.80E+00
	MIN	8.70E+00	1.68E+01	1.72E+02					8.01E+00	3.91E+00
299-W19-09 (216-U-1,2)*	MAX	4.26E+03	5.06E+03	NN	NN	NN	NN	NN	6.50E+03	1.26E+02
	AVG	2.81E+03	3.26E+03						3.38E+03	8.44E+01
	MIN	1.56E+03	1.83E+03						1.54E+03	1.39E+01
299-W19-11 (216-U-1,2)*	MAX	5.24E+03	6.97E+03	1.71E+03	7.78E+00	2.79E+00	6.48E+01	3.58E+00	6.43E+03	1.41E+02
	AVG	4.03E+03	4.98E+03	1.12E+03	2.44E+00	1.67E+00	3.65E+00	-4.60E-01	4.56E+03	1.17E+02
	MIN	2.86E+03	3.27E+03	2.82E+02	-3.85E+00	8.00E-02	-7.76E+01	-1.15E+01	3.04E+03	1.02E+02
299-W19-12 (241-U)*	MAX	4.80E+00	2.84E+01	2.88E+02	9.02E+00	1.36E+00	5.85E+01	4.63E+00	4.69E+00	7.49E+00
	AVG	4.40E+00	1.86E+01	1.79E+02	2.74E+00	4.50E-01	-3.27E+01	1.02E+00	3.67E+00	5.05E+00
	MIN	4.30E+00	9.70E+00	8.61E+01	-1.07E+00	-2.10E-01	-1.42E+02	-2.27E+00	3.26E+00	3.17E+00
299-W19-13 (216-U-16)*	MAX	1.87E+01	2.22E+01	7.28E+02	7.08E+00	1.00E-01	6.45E+01	4.91E+00	1.10E+01	9.99E+01
	AVG	1.02E+01	1.77E+01	2.17E+02	-2.04E+00	4.00E-02	-2.08E+01	-1.55E+00	8.28E+00	2.77E+01
	MIN	7.50E+00	1.16E+01	-1.25E+02	-2.53E+01	-4.00E-02	-8.76E+01	-8.32E+00	5.30E+00	1.84E+01

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Table B-1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1987. (sheet 10 of 14)

Well no. (waste site)		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-W19-14 (216-U-16)*	MAX	5.20E+00	1.32E+01	3.05E+02	4.55E+00	9.80E-01	3.78E+01	6.01E+00	3.19E+00	8.77E+01
	AVG	4.00E+00	1.01E+01	1.02E+02	1.85E+00	5.00E-01	-1.74E+00	3.40E-01	2.85E+00	2.13E+01
	MIN	3.00E+00	8.20E+00	-3.55E+01	-1.52E+00	3.00E-02	-7.62E+01	-8.80E+00	2.58E+00	9.04E+00
299-W19-15 (216-U-1,2)*	MAX	6.52E+02	8.17E+02	NN	NN	NN	NN	NN	5.42E+02	1.28E+02
	AVG	2.22E+02	4.18E+02	NN	NN	NN	NN	NN	2.81E+02	7.77E+01
	MIN	5.81E+01	8.19E+01	NN	NN	NN	NN	NN	1.30E+02	2.17E+00
299-W19-16 (216-U-1,2)*	MAX	1.79E+03	2.68E+03	NN	NN	NN	NN	NN	1.75E+03	9.71E+01
	AVG	1.38E+03	1.89E+03	NN	NN	NN	NN	NN	1.37E+03	5.49E+01
	MIN	1.02E+03	1.42E+03	NN	NN	NN	NN	NN	1.04E+03	3.52E+01
299-W19-17 (216-U-1,2)*	MAX	5.37E+01	8.21E+01	NN	NN	NN	NN	NN	4.11E+01	5.52E+01
	AVG	2.19E+01	6.01E+01	NN	NN	NN	NN	NN	3.29E+01	1.51E+01
	MIN	8.30E+00	4.27E+01	NN	NN	NN	NN	NN	2.13E+01	1.04E+01
299-W19-18 (216-U-1,2)*	MAX	5.09E+03	9.29E+03	NN	NN	NN	NN	NN	6.55E+03	3.03E+02
	AVG	4.48E+03	7.84E+03	NN	NN	NN	NN	NN	5.04E+03	2.37E+02
	MIN	3.62E+03	6.29E+03	NN	NN	NN	NN	NN	4.18E+03	1.67E+02
299-W19-19 (216-U-17)	MAX	5.05E+02	5.18E+02	3.57E+03	6.07E+00	9.30E-01	5.91E+01	5.88E+00	5.14E+02	1.50E+03
	AVG	3.86E+02	2.84E+02	1.67E+03	1.70E-01	4.00E-01	1.13E+01	1.06E+00	3.78E+02	1.27E+03
	MIN	2.72E+02	1.80E+02	1.19E+03	-1.02E+01	-1.00E-01	-3.54E+01	-3.44E+00	2.82E+02	1.10E+03
299-W19-20 (216-U-17)	MAX	3.44E+02	1.15E+03	1.85E+03	1.87E+01	8.70E-01	8.89E+01	8.88E+01	4.89E+02	1.07E+03
	AVG	2.52E+02	6.35E+02	1.46E+03	2.50E+00	3.30E-01	1.09E+01	4.04E+00	2.87E+02	8.88E+02
	MIN	1.54E+02	1.33E+02	8.18E+02	-3.70E+00	-1.30E-01	-3.33E+01	-8.32E+00	1.34E+02	1.01E+02
299-W19-21 (216-U-14)	MAX	1.99E+01	1.89E+01	3.09E+02	5.63E+00	4.70E-01	7.28E+01	6.89E+00	1.83E+01	3.02E+00
	AVG	1.70E+01	1.15E+01	1.21E+02	1.09E+00	3.10E-01	2.62E+01	2.08E+00	1.51E+01	2.40E+00
	MIN	1.18E+01	7.70E+00	-9.86E+01	-4.81E+00	2.00E-02	-2.82E+00	-2.33E+00	8.22E+00	1.26E+00
299-W19-23 (216-U-17)	MAX	1.71E+02	3.45E+02	1.23E+03	3.47E+00	8.20E+00	1.64E+01	3.58E+00	1.56E+02	5.75E+02
	AVG	1.35E+02	2.30E+02	1.04E+03	8.80E-01	9.80E-01	-1.18E+01	4.90E-01	1.40E+02	4.82E+02
	MIN	8.57E+01	8.57E+01	8.47E+02	-3.51E+00	-7.40E-01	-6.41E+01	-4.27E+00	1.26E+02	1.05E+02
299-W19-24 (216-U-17)	MAX	5.48E+02	1.44E+03	2.30E+03	6.43E+00	1.95E+00	8.47E+01	3.20E-01	5.00E+02	1.50E+03
	AVG	4.35E+02	9.92E+02	1.98E+03	2.35E+00	1.25E+00	1.53E+01	-1.52E+00	4.35E+02	1.32E+03
	MIN	1.87E+02	8.26E+02	1.78E+03	-2.53E+00	4.00E-01	-1.42E+01	-3.83E+00	3.78E+02	1.27E+03
299-W19-25 (216-U-17)	MAX	2.93E+02	3.09E+03	2.50E+03	1.07E+01	5.00E-01	1.66E+01	8.96E+00	2.79E+02	7.28E+02
	AVG	2.45E+02	1.95E+03	1.71E+03	2.60E+00	2.10E-01	-1.72E+00	2.31E+00	2.43E+02	6.21E+02
	MIN	1.82E+02	6.37E+02	1.47E+03	-3.05E+00	-7.00E-02	-6.99E+01	-3.57E+00	1.51E+02	1.49E+02

Table B-1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1987. (sheet 11 of 14)

Well no. (waste site)		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PFM)
299-W19-28 (216-U-17)	MAX	1.88E+02	3.83E+02	1.51E+03	8.08E+00	6.40E-01	1.81E+01	3.97E+00	1.66E+02	1.20E+03
	AVG	1.30E+02	2.11E+02	1.38E+03	4.67E+00	1.70E-01	-1.66E+01	3.10E-01	1.23E+02	7.95E+02
	MIN	1.07E+02	8.67E+01	1.30E+03	1.14E+00	-3.90E-01	-7.09E+01	-2.41E+00	8.42E+01	6.21E+02
299-W19-27 (216-U-14)	MAX	1.04E+01	1.92E+01	2.41E+02	5.35E+00	4.70E-01	5.36E+01	4.70E+00	8.83E+00	3.86E+00
	AVG	9.10E+00	1.67E+01	1.23E+02	2.13E+00	0.00E+00	-4.76E+01	-1.33E+00	8.15E+00	3.17E+00
	MIN	8.50E+00	1.16E+01	1.51E+01	-8.16E+00	-2.90E-01	-2.00E+02	-1.40E+01	7.40E+00	2.50E+00
299-W22-01 (216-S-1,2)*	MAX	4.80E+00	3.52E+01	2.40E+02	1.22E+00	1.70E+01	-6.30E+00	4.53E+00	3.06E+00	3.49E+00
	AVG	4.70E+00	3.52E+01	2.40E+02	1.22E+00	1.70E+01	-6.30E+00	4.53E+00	3.06E+00	3.49E+00
	MIN	4.80E+00	3.52E+01	2.40E+02	1.22E+00	1.70E+01	-6.30E+00	4.53E+00	3.06E+00	3.49E+00
299-W22-02 (216-S-1,2)*	MAX	6.00E+00	1.84E+01	4.39E+03	2.02E+00	3.71E+00	2.66E+01	4.79E+00	6.31E+00	2.66E+00
	AVG	5.50E+00	1.84E+01	4.39E+03	2.02E+00	3.71E+00	2.66E+01	4.79E+00	6.31E+00	2.66E+00
	MIN	5.10E+00	1.84E+01	4.39E+03	2.02E+00	3.71E+00	2.66E+01	4.79E+00	6.31E+00	2.66E+00
299-W22-10 (216-S-1,2)*	MAX	3.00E-01	1.20E+02		7.04E+00	7.02E+01	7.52E+01	3.84E+00	NN	NN
	AVG	1.00E-01	8.83E+01	NN	1.90E-01	4.28E+01	2.86E+01	2.70E-01	NN	NN
	MIN	0.00E+00	6.55E+01		-6.30E+00	2.76E+01	-2.19E+01	-4.28E+00		
299-W22-12 (216-S-7)*	MAX		7.10E+00	3.36E+04	-1.48E+01	2.80E-01	3.90E+01	-4.16E+00	NN	3.32E+00
	AVG	NN	6.60E+00	2.61E+04	-1.48E+01	2.80E-01	3.90E+01	-4.16E+00	NN	3.06E+00
	MIN		6.10E+00	1.78E+04	-1.48E+01	2.80E-01	3.90E+01	-4.16E+00		2.81E+00
299-W22-18 (216-S-8)*	MAX	3.40E+00	4.88E+01		4.30E+00	1.20E+01	9.32E+01	5.00E+00	NN	NN
	AVG	2.30E+00	2.20E+01	NN	1.87E+00	3.40E+00	4.95E+01	-1.85E+00	NN	NN
	MIN	1.50E+00	4.20E+00		-1.69E+00	-1.80E-01	1.44E+01	-6.05E+00		
299-W22-20 (216-S-20)*	MAX		4.26E+01	2.68E+05	5.88E+00	9.50E-01	-2.97E+01	3.33E+00	NN	NN
	AVG	NN	3.85E+01	2.55E+05	3.55E+00	4.50E-01	-4.99E+01	1.29E+00	NN	NN
	MIN		3.30E+01	2.33E+05	1.23E+00	-4.09E-02	-7.00E+01	-7.60E-01		
299-W22-21 (216-S-13)*	MAX	1.87E+01	2.24E+02		3.04E+00	1.47E+00	2.24E+01	3.85E+00	1.58E+01	1.42E+01
	AVG	1.61E+01	1.97E+02	NN	-2.40E-01	1.05E+00	-6.20E+00	2.09E+00	1.32E+01	1.31E+01
	MIN	1.45E+01	1.80E+02		-3.53E+00	6.30E-01	-3.48E+01	3.20E-01	1.02E+01	1.12E+01
299-W22-22 (216-U-12)	MAX	1.10E+00	5.10E+00	2.10E+03	7.49E+00	7.80E-01	4.77E+01	1.07E+01	8.15E-01	4.08E+00
	AVG	8.00E-01	3.30E+00	1.88E+03	2.19E+00	2.90E-01	3.39E+00	3.90E-01	4.07E-01	2.04E+00
	MIN	1.00E-01	-3.00E-01	1.59E+03	-9.84E+00	-1.70E-01	-2.53E+01	-7.94E+00	6.79E-02	5.00E-01
299-W22-26 (216-S-9)*	MAX	7.30E+00	2.61E+01	3.14E+04	3.20E+00	1.60E-01	-2.33E+01	-8.70E-01	9.71E+00	NN
	AVG	7.30E+00	2.02E+01	2.58E+04	-3.50E+00	1.30E-01	-4.09E+01	-2.00E+00	9.71E+00	NN
	MIN	7.30E+00	1.27E+01	1.98E+04	-1.02E+01	1.00E-01	-5.85E+01	-3.33E+00	9.71E+00	NN

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Table B-1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1987. (sheet 12 of 14)

Well no. (waste site)		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-W23-01 (216-S-3)*	MAX	1.40E+01	1.45E+03	NN	7.33E+00	9.00E-02	4.23E+01	5.00E+00	1.26E+01	4.35E+01
	AVG	1.40E+01	5.24E+02		4.49E+00	5.00E-02	2.50E-01	1.31E+00	1.26E+01	1.96E+01
	MIN	1.40E+01	3.70E+01		1.61E+00	0.00E+00	-7.03E+01	-4.54E+00	1.26E+01	3.26E+00
299-W23-02 (241-SX)*	MAX	NN	1.44E+03	NN	8.45E+00	4.00E-01	0.00E+00	7.50E-01	NN	3.64E+01
	AVG		1.03E+03		-1.21E+00	2.90E-01	-1.51E+01	-2.73E+00		3.16E+01
	MIN		5.33E+02		-1.30E+01	8.00E-02	-4.14E+01	-4.80E+00		2.67E+01
299-W23-03 (241-SX)*	MAX	NN	1.43E+02	NN	8.82E+00	1.30E-01	1.81E+01	5.98E+00	NN	7.66E+00
	AVG		8.94E+01		-5.90E-01	-2.00E-02	-3.57E+00	-3.16E+00		6.55E+00
	MIN		4.45E+01		-9.10E+00	-3.00E-01	-4.78E+01	-1.28E+01		4.19E+00
299-W23-04 (216-S-21)*	MAX	2.42E+01	8.00E+00	1.67E+03	1.13E+00	6.70E-01	3.20E+01	6.90E-01	1.96E+01	5.92E-01
	AVG	1.87E+01	8.00E+00	1.67E+03	1.13E+00	6.70E-01	3.20E+01	6.90E-01	1.78E+01	5.92E-01
	MIN	1.46E+01	8.00E+00	1.67E+03	1.13E+00	6.70E-01	3.20E+01	6.90E-01	1.58E+01	5.92E-01
299-W23-09 (216-S-25)	MAX	4.84E+01	2.24E+01	1.55E+06	6.11E+00	4.80E-01	4.55E+01	9.82E+00	4.97E+01	4.09E+02
	AVG	2.73E+01	1.26E+01	1.29E+06	1.44E+00	2.40E-01	3.10E-01	1.67E+00	2.70E+01	2.10E+02
	MIN	1.43E+01	8.70E+00	7.76E+05	-6.83E+00	-2.30E-01	-5.56E+01	-1.29E+01	1.83E+01	7.71E+01
299-W23-10 (216-S-25)	MAX	4.47E+01	3.40E+01	1.02E+06	5.05E+00	8.00E-01	5.33E+01	6.39E+00	4.66E+01	2.28E+02
	AVG	3.62E+01	2.05E+01	7.01E+05	2.40E-01	1.70E-01	1.01E+01	7.70E-01	3.47E+01	1.93E+02
	MIN	2.42E+01	1.32E+01	3.08E+05	-8.40E+00	-2.40E-01	-3.87E+01	-6.84E+00	2.70E+01	1.38E+02
299-W23-11 (216-U-10)*	MAX	4.26E+01	1.99E+01	8.51E+04	1.41E+00	NN	4.80E+01	1.71E+00	2.15E+01	2.75E+00
	AVG	2.16E+01	1.11E+01	2.12E+04	-3.30E+00		-3.28E+01	-3.80E-01	1.59E+01	2.55E+00
	MIN	1.79E+01	7.00E+00	1.00E+03	-1.01E+01		-1.15E+02	-2.57E+00	1.28E+01	2.50E+00
299-W26-03 (216-S-6)*	MAX	1.70E+00	5.80E+00	2.71E+02	NN	NN	NN	NN	1.02E+00	2.68E+00
	AVG	1.40E+00	4.30E+00	1.93E+02					8.83E-01	2.17E+00
	MIN	1.20E+00	2.10E+00	1.11E+02					6.79E-01	8.13E-01
299-W26-08 (216-S-5)*	MAX	1.20E+00	6.60E+00	3.70E+02	4.23E+00	1.03E+00	3.38E+01	7.12E+00	NN	4.30E+00
	AVG	8.00E-01	4.40E+00	2.13E+02	2.70E-01	3.40E-01	-4.48E+00	-1.00E+00		3.20E+00
	MIN	8.00E-01	2.50E+00	4.74E+01	-4.87E+00	-1.50E-01	-3.34E+01	-7.18E+00		2.51E+00
299-W27-01 (216-S-26)	MAX	1.03E+01	1.02E+01	1.45E+04	1.22E+01	7.30E-01	1.02E+02	5.51E+00	6.31E+00	1.18E+02
	AVG	7.40E+00	7.50E+00	5.78E+03	3.24E+00	2.70E-01	3.20E+01	4.30E+00	5.18E+00	1.05E+02
	MIN	5.30E+00	5.70E+00	1.08E+02	-2.84E+00	-3.70E-01	-1.08E+01	1.28E+00	4.07E+00	7.82E+01
699-32-72A (216-S-19)*	MAX	1.50E+00	1.57E+01	NN	NN	NN	NN	NN	NN	NN
	AVG	5.00E-01	8.80E+00							
	MIN	-1.00E-01	3.10E+00							

Table B-1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1987. (sheet 13 of 14)

Well no. (waste site)		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
699-35-78A (216-U-10)*	MAX	1.37E+01	1.01E+01	3.19E+02	5.63E+00		-7.33E+00	9.66E+00	1.32E+01	2.50E+00
	AVG	9.40E+00	6.50E+00	8.23E+01	3.08E+00	NN	-3.43E+01	5.06E+00	7.81E+00	1.83E+00
	MIN	4.70E+00	4.40E+00	-1.88E+02	1.61E+00		-5.93E+01	0.00E+00	5.36E+00	5.00E-01
699-42-40A (216-B-3)	MAX	1.70E+00	5.10E+00	7.00E+02	7.48E+00	6.30E-01	6.33E+01	7.14E+00	6.79E-01	2.31E+01
	AVG	7.00E-01	4.10E+00	3.19E+02	2.37E+00	2.10E-01	3.04E+00	2.52E+00	4.75E-01	9.37E+00
	MIN	0.00E+00	3.30E+00	3.40E+00	-7.91E+00	-2.60E-01	-6.34E+01	-4.53E+00	2.72E-01	2.50E+00
699-42-40B (216-B-3)	MAX		6.80E+00	2.77E+03	6.27E+00	4.40E-01	6.83E+01	7.33E+00		2.50E+00
	AVG	NN	4.00E+00	5.25E+02	1.62E+00	1.60E-01	1.19E+01	-4.00E-01	NN	1.51E+00
	MIN		2.10E+00	-9.52E+01	-9.73E+00	-3.00E-02	-3.97E+01	-4.79E+00		5.00E-01
699-45-42 (216-B-3)	MAX	2.10E+00	4.80E+00	5.29E+04	4.05E+00	2.20E-01	6.29E+01	7.28E+00	1.70E+00	
	AVG	1.80E+00	3.90E+00	5.20E+04	-4.58E+00	6.00E-02	-8.54E+00	1.30E-01	1.49E+00	NN
	MIN	1.70E+00	3.00E+00	5.11E+04	-2.03E+01	-2.70E-01	-7.23E+01	-9.83E+00	1.29E+00	
699-50-42 (216-A-25)	MAX	2.30E+00	7.40E+00			3.10E-01				
	AVG	1.50E+00	6.60E+00	NN	NN	1.10E-01	NN	NN	NN	NN
	MIN	6.00E-01	5.80E+00			-1.50E-01				
699-53-47A (216-A-25)	MAX	6.20E+00	1.43E+02		5.61E+00	7.99E+01	3.39E+01	4.66E+00		
	AVG	2.50E+00	1.11E+02	NN	-4.15E+00	6.15E+01	6.26E+00	-3.00E-01	NN	NN
	MIN	1.00E-01	8.68E+01		-1.72E+01	4.27E+01	-3.08E+01	-1.12E+01		
699-53-47B (216-A-25)	MAX	5.40E+00	1.90E+02		6.41E+00	1.15E+02	5.48E+01	2.75E+00		
	AVG	3.70E+00	1.57E+02	NN	3.50E-01	8.52E+01	-8.50E-01	-1.80E-01	NN	NN
	MIN	2.90E+00	1.35E+02		-7.89E+00	7.03E+01	-4.32E+01	-4.16E+00		
699-53-48A (216-A-25)	MAX	1.88E+01	1.62E+01		7.00E+00	1.62E+00	7.85E+01	3.20E+00		
	AVG	4.80E+00	9.70E+00	NN	-6.10E-01	8.00E-01	1.47E+01	-1.10E+00	NN	NN
	MIN	9.00E-01	5.90E+00		-1.01E+01	-1.00E-02	-1.76E+01	-4.16E+00		
699-53-48B (216-A-25)	MAX	2.20E+00	6.91E+02		9.73E+00	4.39E+02	4.42E+01	1.13E+01		
	AVG	4.00E-01	5.45E+02	NN	3.36E+00	3.14E+02	-2.41E+01	2.50E+00	NN	NN
	MIN	-2.00E-01	3.65E+02		-4.91E+00	2.01E+02	-7.36E+01	-3.85E+00		
699-53-55A (216-A-25)	MAX	1.80E+00	9.60E+00		5.36E+00	2.70E-01	3.66E+00	7.70E+00		
	AVG	1.10E+00	8.00E+00	NN	4.35E+00	8.00E-02	-3.65E+01	5.54E+00	NN	NN
	MIN	3.00E-01	8.30E+00		2.61E+00	-2.00E-01	-9.90E+01	4.00E+00		
699-54-48 (216-A-25)	MAX	2.20E+00	1.17E+02		6.39E+00	5.90E+01	6.46E+01	7.18E+00		
	AVG	1.50E+00	1.05E+02	NN	1.95E+00	5.05E+01	1.64E+00	-4.00E-01	NN	NN
	MIN	9.00E-01	8.95E+01		-1.70E+00	3.79E+01	-5.64E+01	-9.24E+00		

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Table B-1. Results of the Unconfined Aquifer Ground-Water Monitoring Network in CY 1987. (sheet 14 of 14)

Well no. (waste site)		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
699-54-49 (216-A-25)	MAX	1.80E+00	1.23E+02			5.81E+01				
	AVG	1.10E+00	8.93E+01	NN	NN	3.26E+01	NN	NN	NN	NN
	MIN	8.00E-01	2.24E+01			1.20E+01				
699-55-50C (216-A-25)	MAX	8.00E-01	5.60E+00			7.60E-01				
	AVG	7.00E-01	4.80E+00	NN	NN	5.00E-01	NN	NN	NN	NN
	MIN	4.00E-01	3.70E+00			-8.00E-02				
699-55-50D (216-A-25)	MAX	1.80E+00	4.58E+01			9.10E-01				
	AVG	9.00E-01	2.48E+01	NN	NN	3.30E-01	NN	NN	NN	NN
	MIN	-1.00E-01	4.80E+00			-1.80E-01				
699-56-51 (216-A-25)	MAX	4.00E-01	5.10E+00							
	AVG	4.00E-01	5.10E+00	NN	NN	NN	NN	NN	NN	NN
	MIN	4.00E-01	5.10E+00							
699-59-58 (216-A-25)	MAX	1.20E+00	5.00E+00			-3.00E-01				
	AVG	1.20E+00	4.80E+00	NN	NN	-3.70E-01	NN	NN	NN	NN
	MIN	1.20E+00	4.50E+00			-4.40E-01				
699-63-58 (216-A-25)	MAX	9.00E-01	1.78E+01			8.00E-02				
	AVG	8.00E-01	1.81E+01	NN	NN	-3.00E-02	NN	NN	NN	NN
	MIN	7.00E-01	1.43E+01			-1.50E-01				

* Inactive disposal facility.

** Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analysis).

a Maximum.

b Average.

c Minimum.

Table B-2. Results of the Confined Aquifer Ground-Water Monitoring Network in CY 1987. (sheet 1 of 2)

Well no. (waste site)		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
299-E26-08	MAX* AVG* MIN*	NN*	NN	1.80E+02 1.00E+02 2.05E+01	NN	NN	NN	NN	NN	<DL**
299-E33-12	MAX AVG MIN	NN	NN	4.92E+02 4.39E+02 3.85E+02	NN	NN	NN	NN	NN	<DL
699-42-40C	MAX AVG MIN	NN	NN	1.17E+03 1.04E+03 9.08E+02	NN	NN	NN	NN	NN	<DL
699-47-50	MAX AVG MIN	NN	NN	3.25E+02 2.95E+02 2.85E+02	NN	NN	NN	NN	NN	8.54E+00 7.65E+00 6.75E+00
699-50-45	MAX AVG MIN	NN	NN	5.61E+01 1.14E+01 -3.34E+01	NN	NN	NN	NN	NN	<DL
699-50-48	MAX AVG MIN	NN	NN	1.30E+02 1.30E+02 1.30E+02	NN	NN	NN	NN	NN	<DL
699-51-46	MAX AVG MIN	NN	NN	7.79E+03 3.84E+03 -1.13E+02	NN	NN	NN	NN	NN	<DL
699-52-46A	MAX AVG MIN	NN	NN	-9.60E+01 -9.60E+01 -9.60E+01	NN	NN	NN	NN	NN	<DL
699-52-48	MAX AVG MIN	NN	NN	1.90E+02 1.60E+02 1.30E+02	NN	NN	NN	NN	NN	<DL
699-53-50	MAX AVG MIN	NN	NN	6.03E+01 -7.10E+00 -7.44E+01	NN	NN	NN	NN	NN	<DL

9 2 1 2 5 0 0 0 9 1 4

Table B-2. Results of the Confined Aquifer Ground-Water Monitoring Network in CY 1987. (sheet 2 of 2)

Well no. (waste site)		Alpha (pCi/L)	Beta (pCi/L)	Tritium (pCi/L)	⁶⁰ Co (pCi/L)	⁹⁰ Sr (pCi/L)	¹⁰⁶ Ru (pCi/L)	¹³⁷ Cs (pCi/L)	Uranium (pCi/L)	Nitrate (PPM)
699-54-57	MAX			6.02E+01						
	AVG	NN	NN	-1.57E+01	NN	NN	NN	NN	NN	<DL
	MIN			-9.36E+01						
699-56-53	MAX			8.18E+01						
	AVG	NN	NN	7.86E+01	NN	NN	NN	NN	NN	<DL
	MIN			7.53E+01						

* Analysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analysis).

** Less than detection limit.

a Maximum.

b Average.

c Minimum.

9 2 1 2 5 0 0 9 1 5

Table B-3. Isotopic Uranium and Plutonium Results for Unconfined Aquifer Wells. (sheet 1 of 2)

Waste Site	Well Number	Sample Date	²³⁴ U (pCi/L)	²³⁵ U (pCi/L)	²³⁸ U (pCi/L)	²³⁹ Pu (pCi/L)	^{239,240} Pu (pCi/L)
216-B-3 Contingency Pond	699-45-42	09/15/87	1.14E+00	3.52E-02	8.60E-01	8.19E-03	2.01E-02
		10/14/87	1.07E+00	2.82E-02	8.81E-01	-1.37E-03	-7.17E-04
		11/15/87	1.24E+00	3.30E-02	9.94E-01	-3.61E-03	-7.16E-04
		12/03/87	1.02E+00	3.00E-02	8.02E-01	-1.37E-03	-7.17E-04
216-B-5 Reverse Well	299-E28-07	08/03/87	8.65E-01	1.64E-02	6.92E-01	2.04E-03	2.04E-03
		09/01/87	1.30E+01	4.31E-01	1.29E+01	7.96E+00	6.36E-02
		09/01/87	1.46E-01	5.99E-03	1.22E-01	1.04E-01	8.68E-03
		08/03/87	1.55E+00	5.92E-02	1.44E+00	2.16E-02	2.70E-03
216-B-62 Crib	299-E28-18	07/17/87	4.38E+01	1.97E+00	4.67E+01	NA*	NA
		07/17/87	2.33E+01	1.01E+00	2.32E+01	NA	NA
216-S-15 Crib	299-W23-09	01/06/87	2.00E+01	8.39E-01	2.07E+01	NA	NA
		07/24/87	1.32E+01	5.29E-01	1.30E+01	NA	NA
	299-W23-10	01/06/87	1.45E+01	5.81E-01	1.48E+01	NA	NA
		07/24/87	2.17E+01	1.32E+00	2.30E+01	NA	NA
216-S-21 Crib	299-W23-04	09/23/87	8.44E+00	2.99E-01	8.42E+00	NA	NA
216-U-1,2 Cribs	299-W19-03	07/22/87	3.43E+03	1.40E+02	3.47E+03	NA	NA
		09/15/87	3.19E+03	1.33E+02	3.16E+03	NA	NA
	299-W19-09	07/22/87	1.33E+03	5.83E+01	1.36E+03	NA	NA
		07/22/87	1.77E+03	1.02E+02	2.01E+03	NA	NA
	299-W19-15	09/15/87	2.62E+03	1.13E+02	2.63E+03	NA	NA
		07/21/87	8.51E+01	2.72E+00	6.77E+01	NA	NA
	299-W19-16	07/23/87	6.62E+02	2.85E+01	6.85E+02	NA	NA
		07/22/87	1.55E+01	5.58E-01	1.62E+01	NA	NA
	299-W19-18	07/20/87	2.62E+03	1.03E+02	2.59E+03	NA	NA
216-U-10 Pond	299-W18-15	07/23/87	2.35E+01	1.02E+00	2.40E+01	NA	NA
		01/19/87	1.00E+01	3.65E-01	9.64E+00	NA	NA
	299-W23-11	07/24/87	9.90E+00	3.47E-01	1.01E+01	NA	NA
		07/08/87	5.05E+00	2.03E-01	4.78E+00	NA	NA
216-U-14 Ditch	299-W19-21	01/05/87	6.09E+00	2.92E-01	6.09E+00	0.00E+00	0.00E+00
		04/19/87	8.47E+00	4.02E-01	8.53E+00	0.00E+00	0.00E+00
	299-W19-27	07/01/87	4.49E+00	3.21E-01	4.20E+00	0.00E+00	0.00E+00
		08/18/87	4.54E+00	1.87E-01	4.86E+00	0.00E+00	0.00E+00
		09/16/87	4.96E+00	1.59E-01	4.77E+00	-5.43E-03	3.34E-03
		10/12/87	9.65E+00	3.80E-01	8.92E+00	6.08E-04	-7.17E-04
		11/11/87	4.95E+00	2.07E-01	4.70E+00	-1.37E-03	-7.16E-04
		12/08/87	4.64E+00	3.40E-01	4.73E+00	-1.37E-03	-7.17E-04

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Table B-3. Isotopic Uranium and Plutonium Results for Unconfined Aquifer Wells. (sheet 2 of 2)

Waste Site	Well Number	Sample Date	²³⁴ U (pCi/L)	²³⁵ U (pCi/L)	²³⁸ U (pCi/L)	²³⁸ Pu (pCi/L)	^{239, 240} Pu (pCi/L)
216-U-16 Crib	299-W19-13	07/21/87	4.47E+00	1.65E-01	4.04E+00	NA	NA
216-U-17 Crib	299-W19-23	05/19/87	6.73E+01	3.40E+00	6.89E+01	5.60E-02	3.88E-03
		06/09/87	7.08E+01	2.88E+00	7.31E+01	0.00E+00	7.44E-03
		07/20/87	7.47E+01	3.57E+00	7.41E+01	4.40E-03	-7.17E-04
		08/13/87	6.76E+01	1.83E+00	5.95E+01	1.97E-02	7.72E-03
		09/16/87	7.30E+01	2.34E+00	6.98E+01	3.97E-02	7.49E-03
		10/12/87	6.21E+01	5.85E+00	6.13E+01	1.85E-02	-1.59E-03
		11/19/87	6.85E+01	3.71E+00	6.69E+01	4.35E-02	6.10E-02
		12/08/87	6.82E+01	3.01E+00	7.11E+01	NA	NA
	299-W19-24	05/15/87	2.30E+02	1.34E+01	2.66E+02	0.00E+00	0.00E+00
		06/09/87	2.48E+02	1.01E+01	2.56E+02	8.81E-03	1.76E-03
		07/20/87	2.33E+02	1.07E+01	2.43E+02	5.62E-03	6.28E-03
		08/13/87	2.17E+02	8.32E+00	2.40E+02	-1.37E-03	-7.18E-04
		09/15/87	2.03E+02	1.00E+01	2.14E+02	2.71E-01	4.03E-02
		10/12/87	2.17E+02	1.06E+01	2.31E+02	-3.04E-03	-1.59E-03
	299-W19-25	05/15/87	1.31E+02	6.67E+00	1.48E+02	0.00E+00	0.00E+00
		06/09/87	1.34E+02	8.90E+00	1.33E+02	2.16E-03	0.00E+00
		07/20/87	1.35E+02	5.71E+00	1.37E+02	2.31E-03	-7.17E-04
		08/13/87	1.24E+02	8.16E+00	1.33E+02	5.23E-03	-7.17E-04
		09/15/87	1.20E+02	5.61E+00	1.23E+02	7.28E-02	1.05E-02
		10/12/87	1.16E+02	4.29E+00	1.20E+02	9.06E-03	-1.59E-03
		11/19/87	1.09E+02	6.80E+00	1.16E+02	-7.39E-04	-1.02E-03
		12/08/87	1.32E+02	6.37E+00	1.38E+02	NA	NA
	299-W19-26	05/15/87	6.11E+01	2.10E+00	6.16E+01	0.00E+00	0.00E+00
		06/10/87	6.92E+01	3.62E+00	6.95E+01	3.67E-03	0.00E+00
		07/20/87	5.68E+01	2.43E+00	5.99E+01	5.15E-04	-7.17E-04
		08/13/87	6.22E+01	1.30E+00	6.14E+01	2.38E-03	1.16E-03
		11/19/87	7.99E+01	2.78E+00	7.87E+01	1.62E-03	4.20E-03
		12/08/87	7.87E+01	8.43E+00	8.25E+01	-1.96E-04	-1.02E-03
200 West	699-36-70	09/15/87	2.32E+01	7.85E-01	2.26E+01	NA	NA

* No analysis performed

Table B-4. Outliers that have been Deleted.

Well	Constituent	Sample date	Result
299-E13-19	Total beta	05/22/87	9.04 E + 01 pCi/L
299-E17-06	Nitrate	03/27/87	1.17 E + 01 ppm
299-E24-08	Nitrate	04/16/87	3.50 E + 01 ppm
299-E25-06	Tritium	02/23/87	1.50 E + 05 pCi/L
299-E28-25	⁹⁰ Sr	10/22/87	2.27 E + 02 pCi/L
299-E34-01	Tritium	10/07/87	1.13 E + 04 pCi/L
299-W19-16	Nitrate	04/17/87	4.44 E + 00 ppm
299-W19-19	Nitrate	06/09/87	8.28 E + 01 ppm
299-W19-24	Nitrate	06/09/87	7.77 E + 01 ppm
299-W23-11	Tritium	05/15/87	1.51 E + 06 pCi/L
699-42-40B	Tritium	02/13/87	1.50 E + 04 pCi/L

NOTE: These outliers were not used in the averages listed in Table B-1.

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APPENDIX C

**SEPARATIONS AREA CONFINED AND UNCONFINED AQUIFER GROUND-WATER
MONITORING SCHEDULES FOR CY 1988**

92125000919

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C-1	Separations Area Unconfined Aquifer Ground-Water Monitoring Schedule for CY 1988	C-3
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Table C-1. Separations Area Unconfined Aquifer Ground Water Monitoring Schedule for CY 1988. (sheet 1 of 7)

Well	EMA ^a No.	Site monitored	Sample method	Total alpha	Total beta	³ H	⁶⁰ Co	⁹⁰ Sr	⁹⁹ Tc	¹⁰⁶ Ru	¹²⁹ I	¹³⁷ Cs	U	Iso. U	Iso. Pu	NO ₃
299-E13-05	2314	216-B-18	P ^b	- ^c	Q ^d	Q	-	-	-	-	-	-	-	-	-	-
299-E13-08	2334	216-B-21	B ^e	-	Q	-	Q	-	-	Q	-	Q	-	-	-	-
299-E13-14	2340	216-B-29	P	-	Q	-	-	-	-	-	-	-	-	-	-	-
299-E13-19	2352	216-B-28	B	-	Q	-	-	-	-	-	-	-	-	-	-	-
299-E16-02	2372	216-A-30	B	M ^f	M	M	M	Q	-	M	-	M	-	-	-	M
299-E17-01	2328	216-A-10	P	M/Q ^g	M/Q	M/Q	M/Q	Q	-	M/Q	Q	M/Q	-	-	-	M/Q
299-E17-02	2367	216-A-27	B	M	M	M	Q	Q	-	Q	S ^h	Q	Q	-	-	M
219-E17-05	2511	216-A-36B	P	M	M	M	M	Q	-	M	-	M	M	-	-	M
299-E17-06	2512	216-A-36B	P	-	M/Q	Q	-	-	-	-	Q	-	-	-	-	Q
299-E17-08	2513	216-A-10	P	-	M/Q	M/Q	Q	Q	-	Q	-	Q	-	-	-	M/Q
299-E17-09	2514	216-A-36B	P	M	M	M	M	Q	-	M	Q	M	M	-	-	M
299-E17-12	2399	216-A-45	P	M	M	M	M	M	-	M	Q	M	M	M	M	M
299-E17-13	2400	216-A-45	P	M	M	M	M	M	-	M	Q	M	M	M	M	M
299-E24-01	2317	216-A-5	B	-	M	M	Q	S	-	Q	-	Q	-	-	-	M
299-E24-02	2329	216-A-10	P	M/Q	M/Q	M/Q	M/Q	M/Q	-	M/Q	-	M/Q	-	-	-	M/Q
299-E24-04	2326	216-A-9	P	-	M/Q	M/Q	Q	S	-	Q	-	Q	-	-	-	M/Q
299-E24-08	2355	216-C-3, 4, 5	P	-	M/Q	M/Q	Q	-	-	Q	-	Q	-	-	-	M/Q
299-E24-11	2518	216-A-10	B	-	M	Q	Q	Q	-	Q	-	Q	-	-	-	Q
299-E24-12	2521	216-A-21, 31	P	-	M/Q	M/Q	Q	Q	-	Q	-	Q	-	-	-	M/Q
299-E24-13	2383	241-A	B	-	Q	-	-	-	-	-	-	-	-	-	-	Q
299-E25-02	2316	216-A-1, 7	B	-	S	S	-	-	-	-	-	-	-	-	-	S
299-E25-03	2318	216-A-6	B	-	Q	-	-	-	-	-	-	-	-	-	-	-
299-E25-06	2343	216-A-8	B	M	M	M	Q	Q	-	Q	-	Q	-	-	-	Q
299-E25-09	2344	216-A-8	B	M	M	Q	Q	Q	-	Q	-	Q	Q	-	-	Q

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Table C-1. Separations Area Unconfined Aquifer Ground Water Monitoring Schedule for CY 1988. (sheet 2 of 7)

Well	EMA ^a No.	Site monitored	Sample method	Total alpha	Total beta	3H	⁶⁰ Co	⁹⁰ Sr	⁹⁹ Tc	¹⁰⁶ Ru	¹²⁹ I	¹³⁷ Cs	U	Iso. U	Iso. Pu	NO ₃
299-E25-10	2363	216-A-18, 19, 20	P	Q/S	Q/S	-	Q/S	-	-	Q/S	-	Q/S	Q/S	-	-	-
299-E25-11	2370	216-A-30	B	M	M	M	M	Q	-	M	-	M	-	-	-	M
299-E25-13	2523	241-AX	B	-	Q	-	-	-	-	-	-	-	-	-	-	Q
299-E25-17	2386	216-A-37-1	B	M	M	M	Q	Q	-	Q	-	Q	-	-	-	M
299-E25-18	2387	216-A-37-1	P	M/Q	M/Q	M/Q	Q	Q	-	Q	-	Q	-	-	-	M/Q
299-E25-19	2388	216-A-37-1	B	M/Q	M/Q	M/Q	Q	Q	-	Q	-	Q	-	-	-	M/Q
299-E25-20	2389	216-A-37-1	P	M/Q	M/Q	M/Q	Q	Q	-	Q	-	Q	-	-	-	M/Q
299-E25-21	2391	216-A-37-2	P	M/Q	M/Q	M/Q	M/Q	Q	-	M/Q	-	M/Q	-	-	-	M/Q
299-E25-22	2392	216-A-37-2	P	M/Q	M/Q	M/Q	M/Q	Q	-	M/Q	-	M/Q	-	-	-	M/Q
299-E25-23	2393	216-A-37-2	P	M/Q	M/Q	M/Q	M/Q	Q	-	M/Q	-	M/Q	-	-	-	M/Q
299-E25-24	2394	216-A-37-2	P	M/Q	M/Q	M/Q	M/Q	Q	-	M/Q	-	M/Q	-	-	-	M/Q
299-E26-02	2364	216-A-24	B	-	Q	Q	-	-	-	-	-	-	-	-	-	Q
299-E26-04	2362	216-A-24	B	-	Q	Q	-	-	-	-	-	-	-	-	-	Q
299-E26-06	2369	401-A Cooling	B	Q	Q	Q	Q	Q	-	Q	-	Q	-	-	-	Q
299-E27-05	2551	216-C-10	P	-	Q/S	-	Q/S	-	-	Q/S	-	Q/S	-	-	-	-
299-E27-07	2557	241-C	P	Q/S	Q/S	-	-	-	-	-	-	-	-	-	-	Q/S
299-E28-07	2404	216-B-5	B	Q	Q	-	Q	Q	-	Q	-	Q	Q	S	Q	-
299-E28-09	2357	216-B-12	B	Q	Q	-	-	-	-	-	-	-	Q	-	-	-
299-E28-12	2380	216-B-55	B	-	M	M	M	-	-	M	-	M	-	-	-	-
299-E28-13	2324	216-B-55	P	-	M/Q	M/Q	M/Q	-	-	M/Q	-	M/Q	-	-	-	-
299-E28-16	2325	216-B-12	P	Q/S	Q/S	-	-	-	-	-	-	-	Q/S	-	-	-
299-E28-17	2519	216-B-6, 10B	B	Q	-	-	-	-	-	-	-	-	Q	-	-	-
299-E28-18	2524	216-B-62	P	M	M	M	M	Q	-	M	-	M	M	S	-	M
299-E28-19	2525	200-East	B	Q	Q	-	-	-	-	-	-	-	Q	-	-	-

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Table C-1. Separations Area Unconfined Aquifer Ground Water Monitoring Schedule for CY 1988. (sheet 3 of 7)

Well	EMA ^a No.	Site monitored	Sample method	Total alpha	Total beta	³ H	⁶⁰ Co	⁹⁰ Sr	⁹⁹ Tc	¹⁰⁶ Ru	¹²⁹ I	¹³⁷ Cs	U	Iso. U	Iso. Pu	NO ₃
299-E28-21	2556	216-B-62	P	M	M	M	M	Q	-	M	-	M	M	S	-	M
299-E28-23	2390	216-B-5	P	Q	Q	Q	Q	Q	-	Q	-	Q	Q	S	Q	Q
299-E28-24	2560	216-B-5	B	Q	Q	-	Q	Q	-	Q	-	Q	Q	S	Q	-
299-E28-25	2561	216-B-5	B	Q	Q	-	Q	Q	-	Q	-	Q	Q	S	Q	-
299-E32-01	2358	LLBG	P	-	S	S	-	-	-	-	-	-	-	-	-	S
299-E33-01	2301	216-B-43	P	-	Q/S	-	Q/S	Q/S	-	Q/S	-	Q/S	-	-	-	-
299-E33-03	2303	216-B-44, 45, 46	P	-	Q/S	Q/S	Q/S	S	-	Q/S	-	Q/S	-	-	-	-
299-E33-05	2308	216-B-47	P	-	Q/S	S	Q/S	Q/S	-	Q/S	-	Q/S	-	-	-	-
299-E33-07	2305	216-B-48, 49, 50	B	-	Q	-	Q	Q	-	Q	-	Q	-	-	-	-
299-E33-08	2300	216-B-41	P	-	Q/S	-	Q/S	Q/S	-	Q/S	-	Q/S	-	-	-	-
299-E33-09	2299	241-BY	B	-	Q	Q	Q	Q	-	Q	-	Q	-	-	-	Q
299-E33-10	2306	216-B-35, 41	P	-	Q/S	Q/S	Q/S	S	-	Q/S	-	Q/S	-	-	-	Q/S
299-E33-18	2309	216-B-7A, 7B	P	-	Q/S	-	Q/S	S	-	Q/S	-	Q/S	-	-	-	-
299-E33-20	2332	216-B-7, 11	B	-	Q	-	-	S	-	-	-	-	-	-	-	Q
299-E33-21	2353	216-B-36	P	-	Q	-	Q	-	-	Q	-	Q	-	-	-	-
299-E33-24	2520	216-B-57	P	-	Q/S	-	Q/S	Q/S	Q/S	Q/S	-	Q/S	-	-	-	-
299-E33-26	2382	216-B-61	P	-	Q/S	-	Q/S	Q/S	-	Q/S	-	Q/S	-	-	-	-
299-E34-01	2374	216-B-63	P	M/Q	M/Q	M/Q	M/Q	-	-	M/Q	-	M/Q	-	-	-	-
299-W10-01	2892	216-T-5	B	-	Q	-	Q	Q	-	Q	-	Q	-	-	-	-
299-W10-03	2885	216-T-32	B	Q	Q	-	Q	Q	-	Q	-	Q	-	-	-	-
299-W10-04	2886	216-T-36	P	-	Q/S	-	S	S	-	S	-	S	-	-	-	-
299-W10-08	2996	241-T	P	Q/S	Q/S	-	Q/S	Q/S	-	Q/S	-	Q/S	-	-	-	Q/S
299-W10-09	3009	241-T	P	Q/S	Q/S	-	Q/S	Q/S	-	Q/S	-	Q/S	-	-	-	Q/S
299-W11-07		216-T-3	B	Q	Q	-	-	-	-	-	-	-	-	-	-	-

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Table C-1. Separations Area Unconfined Aquifer Ground Water Monitoring Schedule for CY 1988. (sheet 4 of 7)

Well	EMA ^a No.	Site monitored	Sample method	Total alpha	Total beta	³ H	⁶⁰ Co	⁹⁰ Sr	⁹⁹ Tc	¹⁰⁶ Ru	¹²⁹ I	¹³⁷ Cs	U	Iso. U	Iso. Pu	NO ₃
299-W11-11	2887	216-T-18	P	Q/S	Q/S	-	Q/S	Q/S	-	Q/S	-	Q/S	-	-	-	-
299-W11-14		216-T-33	B	Q	Q	-	-	-	-	-	-	-	-	-	-	-
299-W11-15	2961	216-T-32	P	-	Q	-	-	-	-	-	-	-	-	-	-	-
299-W11-18	2963	216-T-35	P	-	Q/S	-	Q/S	S	-	Q/S	-	Q/S	-	-	-	-
299-W11-23	2616	241-T	P	Q/S	Q/S	-	Q/S	Q/S	-	Q/S	-	Q/S	-	-	-	Q/S
299-W11-24	3010	241-T	P	Q/S	Q/S	-	Q/S	Q/S	-	Q/S	-	Q/S	-	-	-	Q/S
299-W14-02	2895	216-T-26, 27, 28	P	Q/S	Q/S	Q/S	Q/S	S	-	Q	-	Q	-	-	-	-
299-W14-05	3007	241-TX	P	-	Q/S	Q/S	-	-	-	-	-	-	-	-	-	Q/S
299-W14-06	3008	241-TX	P	-	Q	Q	-	-	-	-	-	-	-	-	-	Q
299-W14-10	3018	216-W-LWC	P	M/Q	M/Q	M/Q	M/Q	Q	-	M/Q	-	M/Q	-	-	-	M/Q
299-W15-02		218-W-4A	B	Q	Q	-	-	-	-	-	-	-	-	-	-	-
299-W15-03	2894	241-TY	B	Q	Q	-	S	S	-	S	-	S	-	-	-	Q
299-W15-04	2896	216-T-19	P	-	Q/S	Q/S	-	-	-	-	-	-	-	-	-	Q/S
299-W15-06	2934	216-Z-9	P	Q	Q	-	-	-	-	-	-	-	-	-	-	Q
299-W15-07	2960	216-Z-7	P	Q/S	Q/S	-	Q/S	S	-	Q/S	-	Q/S	-	-	-	Q/S
299-W15-08	2974	216-Z-9	B	Q	Q	-	-	-	-	-	-	-	-	-	-	-
299-W15-10	2609	216-Z-16	P	Q/S	Q/S	-	-	-	-	-	-	-	-	-	-	Q/S
299-W15-11	2610	216-Z-16	P	Q/S	Q/S	-	Q/S	Q/S	-	Q/S	-	Q/S	-	-	-	Q/S
299-W18-05	2933	216-Z-12	P	Q/S	Q/S	-	-	-	-	-	-	-	-	-	-	-
299-W18-06	2951	216-Z-1A	B	Q	Q	-	-	-	-	-	-	-	-	-	-	-
299-W18-07	2952	216-Z-1A	B	Q	Q	-	-	-	-	-	-	-	-	-	-	-
299-W18-09	2964	216-Z-18	B	Q	Q	-	-	-	-	-	-	-	-	-	-	Q
299-W18-15	3015	216-U-10	P	M/Q	M/Q	M/Q	Q	-	-	Q	-	Q	M/Q	S	S	M/Q
299-W18-17	3016	216-Z-20	B	M	M	Q	Q	-	-	Q	-	Q	-	-	-	Q

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Table C-1. Separations Area Unconfined Aquifer Ground Water Monitoring Schedule for CY 1988. (sheet 5 of 7)

Well	EMA ^a No.	Site monitored	Sample method	Total alpha	Total beta	³ H	⁶⁰ Co	⁹⁰ Sr	⁹⁹ Tc	¹⁰⁶ Ru	¹²⁹ I	¹³⁷ Cs	U	Iso. U	Iso. Pu	NO ₃
299-W18-20	3020	216-Z-20	B	M	M	Q	Q	-	-	Q	-	Q	-	-	-	Q
299-W19-02	2928	216-U-8	P	M	M	Q	Q	Q	-	Q	-	Q	M	-	-	M
299-W19-03	2929	216-U-1, 2	P	M/Q	M/Q	Q	M/Q	Q	M/Q	M/Q	-	M/Q	M/Q	S	-	M/Q
299-W19-05	2968	216-S-23	P	-	Q/S	Q/S	-	-	-	-	-	-	-	-	-	Q/S
299-W19-09	2624	216-U-1, 2	P	M/Q	M/Q	Q	M/Q	S	M/Q	M/Q	-	M/Q	M/Q	S	-	M/Q
299-W19-11	2619	216-U-1, 2	P	M	M	Q	M	Q	M	M	-	M	M	S	-	M
299-W19-12	2618	241-U	P	Q/S	Q/S	Q/S	Q/S	Q/S	-	Q/S	-	Q/S	Q/S	-	-	Q/S
299-W19-13	2622	216-U-16	P	M/Q	M/Q	M/Q	M/Q	Q	-	M/Q	-	M/Q	M/Q	-	-	M/Q
299-W19-14	2623	216-U-16	P	M/Q	M/Q	M/Q	M/Q	Q	-	M/Q	-	M/Q	M/Q	-	-	M/Q
299-W19-15	2625	216-U-1, 2	P	M/Q	M/Q	Q	M/Q	S	M/Q	M/Q	-	M/Q	M/Q	S	-	M/Q
299-W19-16	2626	216-U-1, 2	P	M/Q	M/Q	Q	M/Q	S	M/Q	M/Q	-	M/Q	M/Q	S	-	M/Q
299-W19-17	2627	216-U-1, 2	P	M/Q	M/Q	Q	M/Q	S	M/Q	M/Q	-	M/Q	M/Q	S	-	M/Q
299-W19-18	2628	216-U-1, 2	P	M	M	Q	M	S	M	M	-	M	M	S	-	M
299-W19-19	2631	216-U-17	P	M	M	M	Q	Q	M	Q	-	Q	M	Q	-	M
299-W19-20	2629	216-U-17	P	M	M	M	Q	Q	M	Q	-	Q	M	Q	-	M
299-W19-21	2630	216-U-14	P	M/Q	M/Q	M/Q	Q	Q	-	Q	-	Q	M/Q	M/Q	Q	M/Q
299-W19-23	2663	216-U-17	P	M	M	M	Q	Q	M	Q	-	Q	M	M	Q	M
299-W19-24	2664	216-U-17	P	M	M	M	Q	Q	M	Q	-	Q	M	M	Q	M
299-W19-25	2665	216-U-17	P	M	M	M	Q	Q	M	Q	-	Q	M	M	Q	M
299-W19-26	2666	216-U-17	P	M	M	M	Q	Q	M	Q	-	Q	M	M	Q	M
299-W19-27	2673	216-U-14	P	M/Q	M/Q	M/Q	Q	Q	-	Q	-	Q	M/Q	M/Q	Q	M/Q
299-W22-01	2919	216-S-1, 2	P	Q	Q	Q	Q	Q	-	Q	-	Q	-	-	-	Q
299-W22-02	2920	216-S-1, 2	P	Q	Q	Q	Q	Q	-	Q	-	Q	-	-	-	Q

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Table C-1. Separations Area Unconfined Aquifer Ground Water Monitoring Schedule for CY 1988. (sheet 6 of 7)

Well	EMA ^a No.	Site monitored	Sample method	Total alpha	Total beta	3H	60Co	90Sr	99Tc	106Ru	129I	137Cs	U	Iso. U	Iso. Pu	NO ₃
299-W22-10	2632	216-S-1, 2	B	Q	Q	-	Q	Q	-	Q	-	Q	-	-	-	-
299-W22-12	2912	216-S-7	P	-	Q/S	Q/S	S	S	-	S	-	S	-	-	-	Q/S
299-W22-18	2633	216-S-8	B	Q	Q	-	Q	Q	-	Q	-	Q	-	-	-	-
299-W22-20	2926	216-S-20	P	-	Q/S	Q/S	S	S	-	S	-	S	-	-	-	-
299-W22-21	2931	216-S-13	P	Q/S	Q/S	-	S	S	-	S	-	S	Q/S	-	-	Q/S
299-W22-22	2939	216-U-12	P	M/Q	M/Q	M/Q	M/Q	Q	-	M/Q	-	M/Q	M/Q	-	-	M/Q
299-W22-26	2954	216-S-9	P	-	Q/S	Q/S	S	S	-	S	-	S	-	-	-	-
299-W23-01	2898	216-S-3	B	-	Q	-	Q	S	-	Q	-	Q	-	-	-	Q
299-W23-02	2910	241-SX	B	-	M	-	Q	Q	M	Q	-	Q	-	-	-	Q
299-W23-03	2911	241-SX	B	-	Q	-	Q	Q	-	Q	-	Q	-	-	-	Q
299-W23-04	2925	216-S-21	B	Q	Q	Q	-	-	-	-	-	-	Q	S	-	Q
299-W23-07	2980	241-S	B	-	M	-	-	-	M	-	-	-	-	-	-	-
299-W23-09	2993	216-S-25	B	M	M	M	M	Q	-	M	-	M	M	Q	-	M
299-W23-10	2994	216-S-25	P	M/Q	M/Q	M/Q	M/Q	Q	-	M/Q	-	M/Q	M/Q	Q	-	M/Q
299-W23-11	2995	216-U-10	P	M/Q	M/Q	M/Q	M/Q	-	-	M/Q	-	M/Q	M/Q	Q	-	M/Q
299-W26-03	2917	216-S-6	P	Q/S	Q/S	Q/S	-	-	-	-	-	-	-	-	-	Q/S
299-W26-06	2620	216-S-5	P	Q/S	Q/S	Q/S	Q/S	Q/S	-	Q/S	-	Q/S	-	-	-	Q/S
299-W27-01	2621	216-S-26	P	M/Q	M/Q	Q	Q	Q	-	Q	-	Q	Q	Q	Q	Q
699-32-72A	4868	216-S-19	P	M/S	M/S	-	-	-	-	-	-	-	-	-	-	-
699-35-78A	4869	216-U-10	P	M/Q	M/Q	M/Q	Q	-	-	Q	-	Q	M/Q	Q	-	Q
699-38-70	4493	600-Area	P	M	M	-	-	-	M	-	-	-	M	-	-	-
699-42-40A	4874	216-B-3	P	M/Q	M/Q	M/Q	M/Q	Q	-	M/Q	-	M/Q	Q	Q	Q	Q
699-42-40B	4875	216-B-3	B	-	M	M	M	Q	-	M	-	M	-	-	-	Q
699-45-42	4958	216-B-3	P	M	M	M	M	M	-	M	-	M	M	M	M	M

9 2 1 2 5 0 0 0 9 2 7

Table C-1. Separations Area Unconfined Aquifer Ground Water Monitoring Schedule for CY 1988. (sheet 7 of 7)

Well	EMA ^a No.	Site monitored	Sample method	Total alpha	Total beta	³ H	⁶⁰ Co	⁹⁰ Sr	⁹⁹ Tc	¹⁰⁶ Ru	¹²⁹ I	¹³⁷ Cs	U	Iso. U	Iso. Pu	NO ₃
699-50-42	4610	216-A-25	P	S	S	-	-	Q/S	-	-	-	-	-	-	-	-
699-53-47A	4866	216-A-25	P	M	M	-	M	M	-	M	-	M	-	-	-	-
699-53-47B	4600	216-A-25	P	M/Q	M/Q	-	M/Q	M/Q	-	M/Q	-	M/Q	-	-	-	-
699-53-48A	4893	216-A-25	P	M/Q	M/Q	-	M/Q	M/Q	-	M/Q	-	M/Q	-	-	-	-
699-53-48B	4894	216-A-25	P	M/Q	M/Q	-	M/Q	M/Q	-	M/Q	-	M/Q	-	-	-	-
699-53-55A	4867	216-A-25	P	M/S	M/S	-	Q	Q	-	Q	-	Q	-	-	-	-
699-54-48	4895	216-A-25	P	M/Q	M/Q	-	M/Q	M/Q	-	M/Q	-	M/Q	-	-	-	-
699-54-49	4732	216-A-25	P	M/Q	M/Q	-	-	M/Q	-	-	-	-	-	-	-	-
699-55-50C	4887	216-A-25	P	Q/S	Q/S	-	-	Q/S	-	-	-	-	-	-	-	-
699-55-50D	4730	216-A-25	B	Q	Q	-	-	Q	-	-	-	-	-	-	-	-
699-59-58	4734	216-A-25	P	S	S	-	-	S	-	-	-	-	-	-	-	-
699-63-58	4741	216-A-25	P	S	S	-	-	S	-	-	-	-	-	-	-	-

^aIdentification number used by U.S. Testing Laboratory.^bPump.^cAnalysis not necessary (as determined from inventory, effluent history, or gross alpha/beta analyses).^dQuarterly.^eBailer.^fMonthly.^gNormal/modified sampling intervals: modified intervals are temporary.^hSemiannually.

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Table C-2. Separations Area Confined Aquifer Monitoring
Schedule for CY 1988.

Well	EMA ^a No.	Site monitored	Sample method	3H	NO ₃
299-E26-08	2395	Rattlesnake Ridge	Bailer	S	S
299-E33-12	2294	Rattlesnake Ridge	Bailer	S	S
699-42-40C	4881	Rattlesnake Ridge	Bailer	S	S
699-47-50	4882	Rattlesnake Ridge	Bailer	S	S
699-49-55B	4743	Rattlesnake Ridge	Bailer	S	S
699-50-45	4759	Rattlesnake Ridge	Bailer	S	S
699-50-48	4883	Rattlesnake Ridge	Bailer	S	S
699-51-46	4884	Rattlesnake Ridge	Bailer	S	S
699-52-46A	4885	Rattlesnake Ridge	Bailer	S	S
699-52-48	4886	Rattlesnake Ridge	Bailer	S	S
699-53-50	4849	Rattlesnake Ridge	Bailer	S	S
699-54-57	4469	Rattlesnake Ridge	Bailer	S	S
699-56-53'	4892	Rattlesnake Ridge	Bailer	S	S

^aIdentification number used in PNL data base.
S = Semiannually.

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APPENDIX D

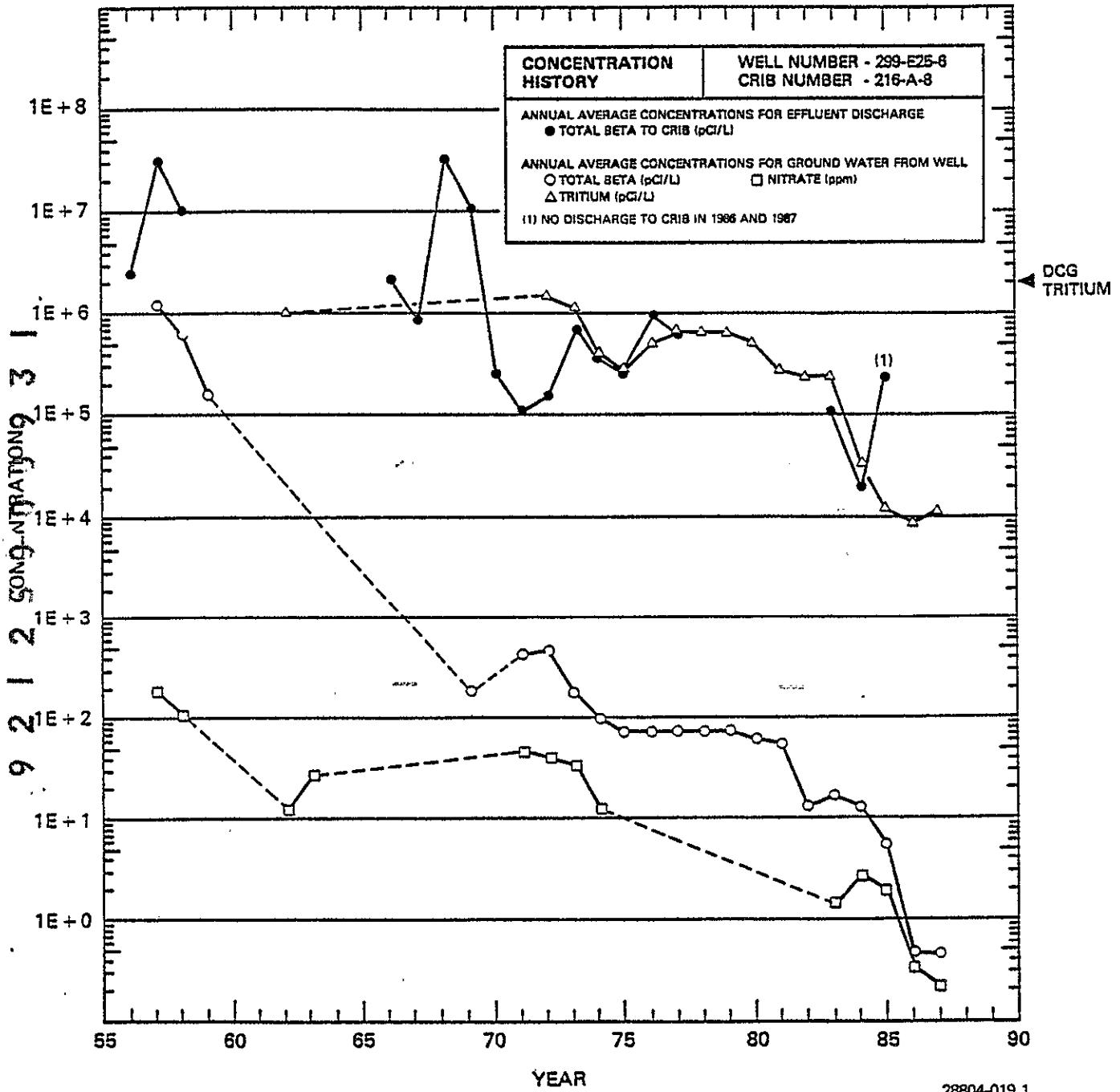
LONG-TERM CONCENTRATION HISTORIES OF SELECTED LIQUID WASTE
DISPOSAL SITES AND MONITORING WELLS

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CONTENTS

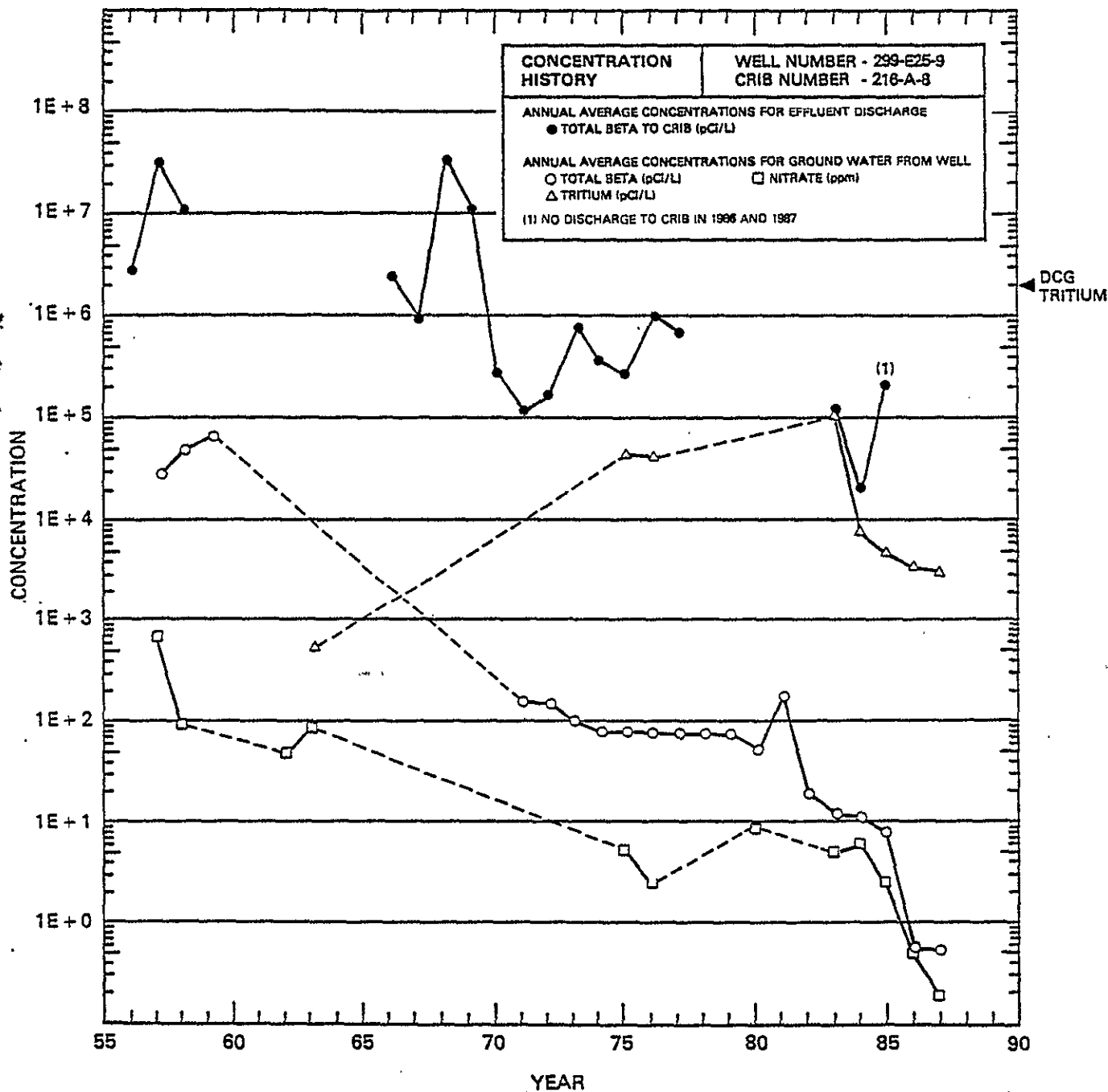
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Well 299-E24-2, Crib 216-A-10	D-6
Well 299-E16-2, Crib 216-A-30	D-7
Well 299-E25-11, Crib 216-A-30	D-8
Well 299-E17-5, Crib 216-A-36B	D-9
Well 299-E17-9, Crib 216-A-36B	D-10
Well 299-E25-17, Crib 216-A-37-1	D-11
Well 299-E25-18, Crib 216-A-37-1	D-12
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Well 299-E28-12, Crib 216-B-55	D-15
Well 299-E28-13, Crib 216-B-55	D-16
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Well 299-W22-22, Crib 216-U-12	D-19

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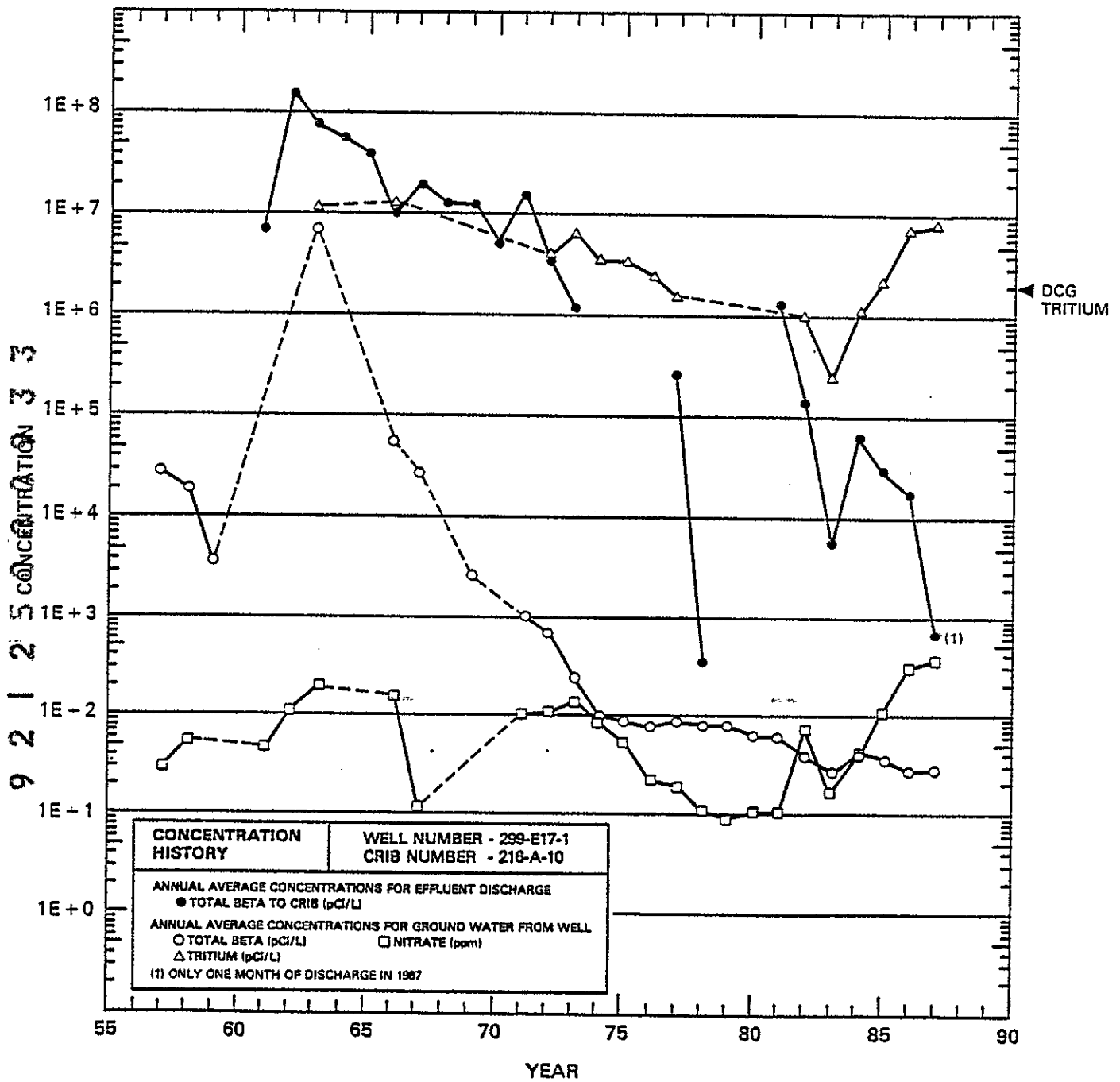
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Well 299-E25-9, Crib 216-A-8

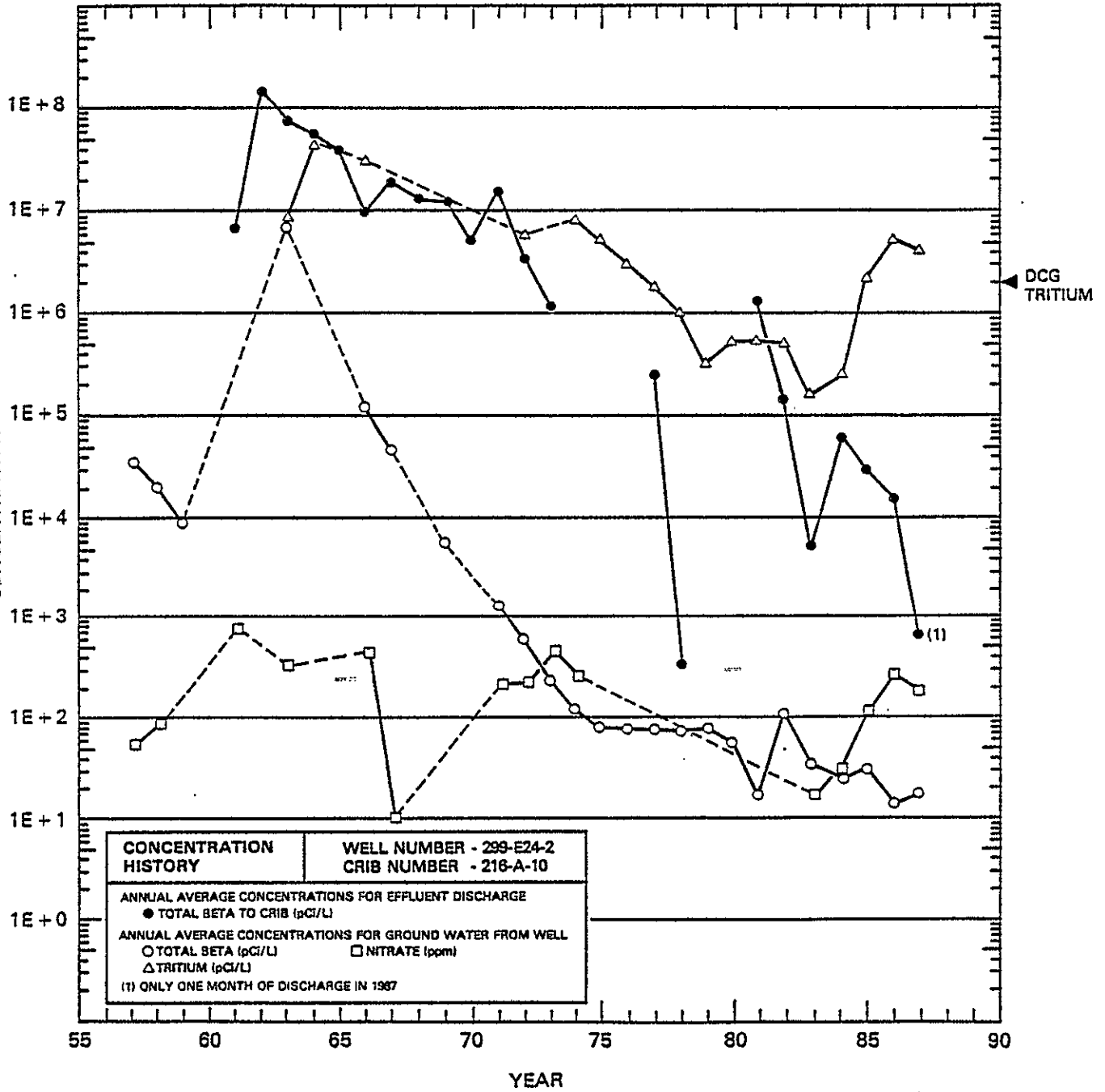
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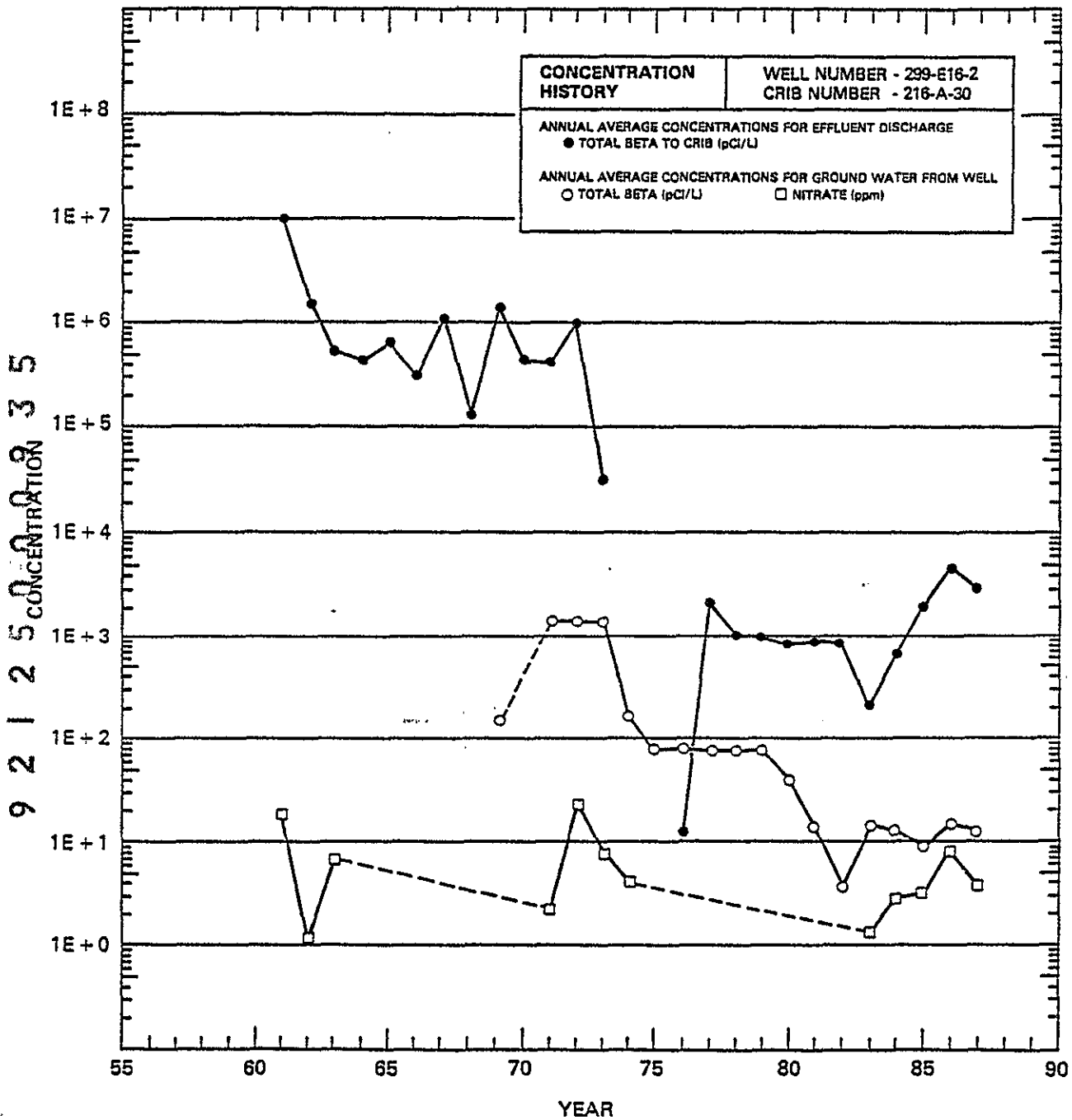
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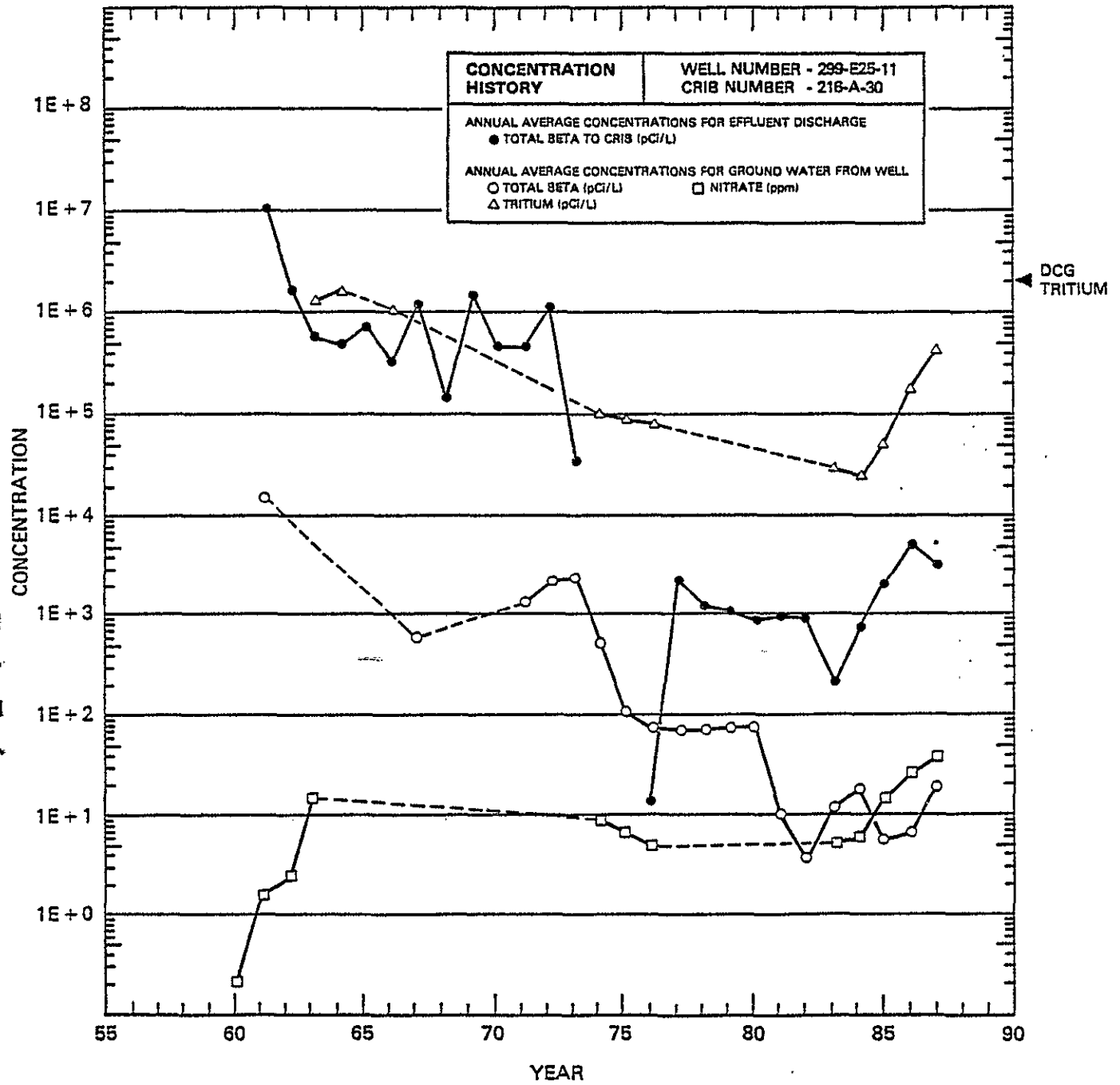
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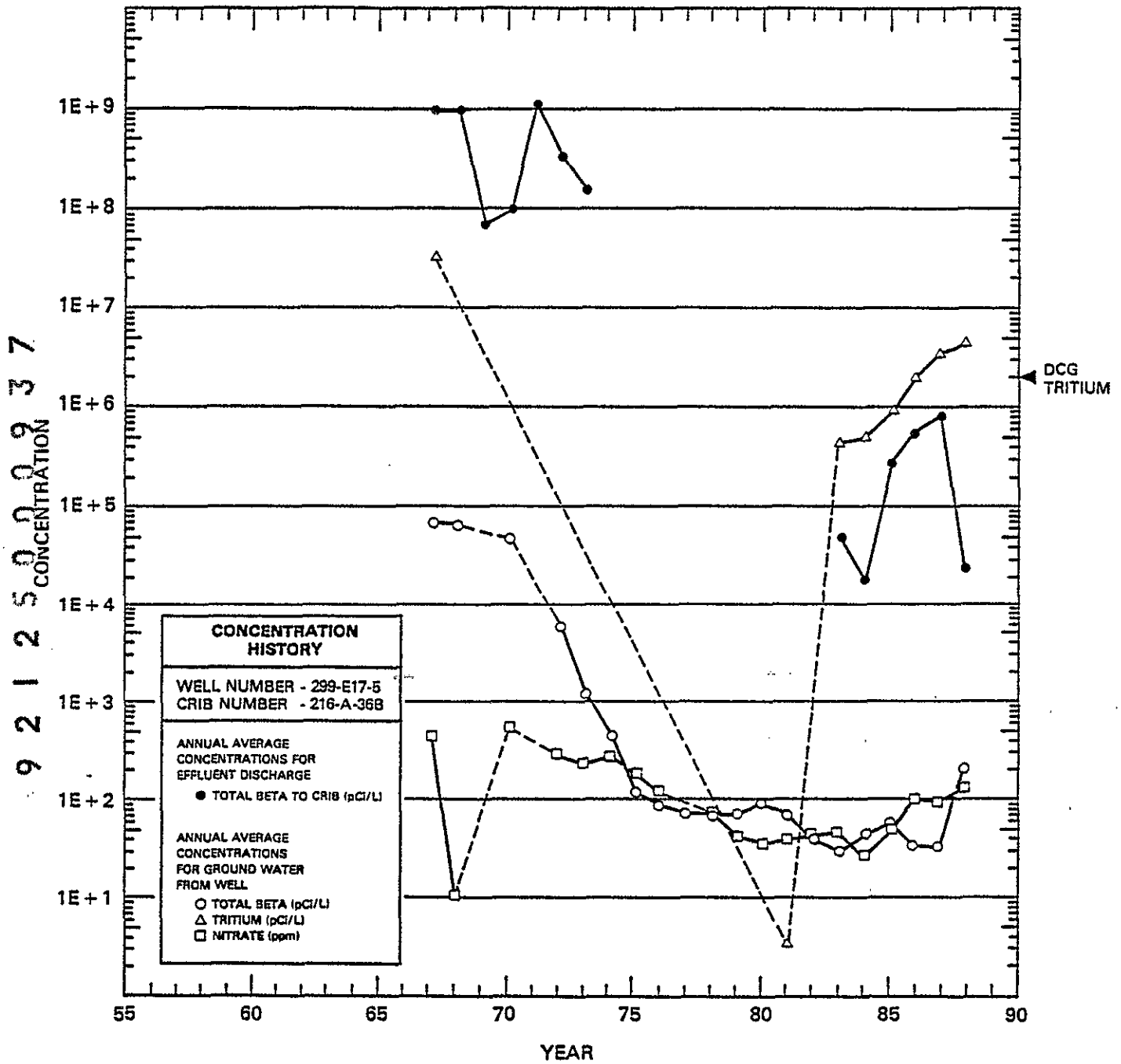
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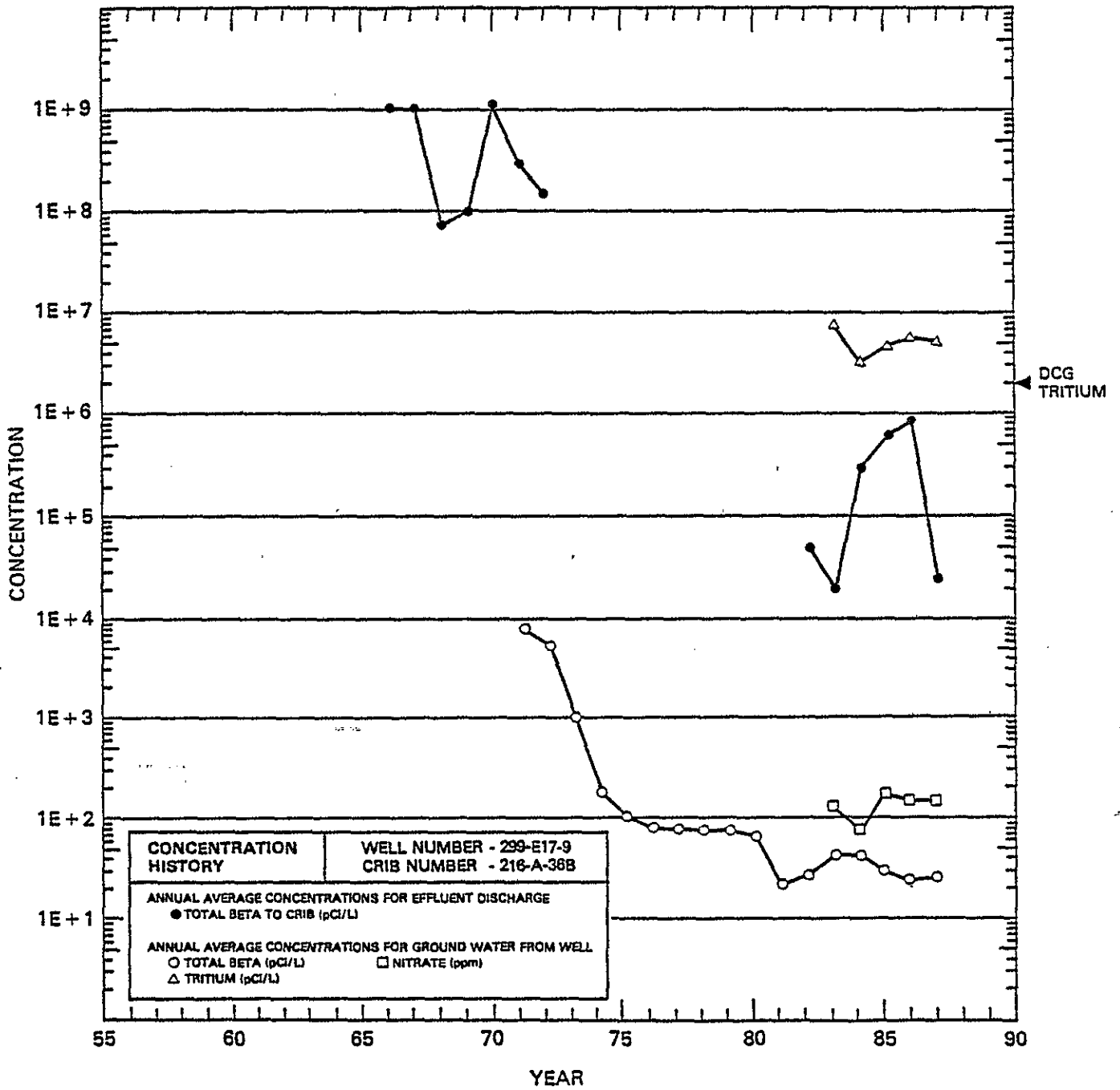
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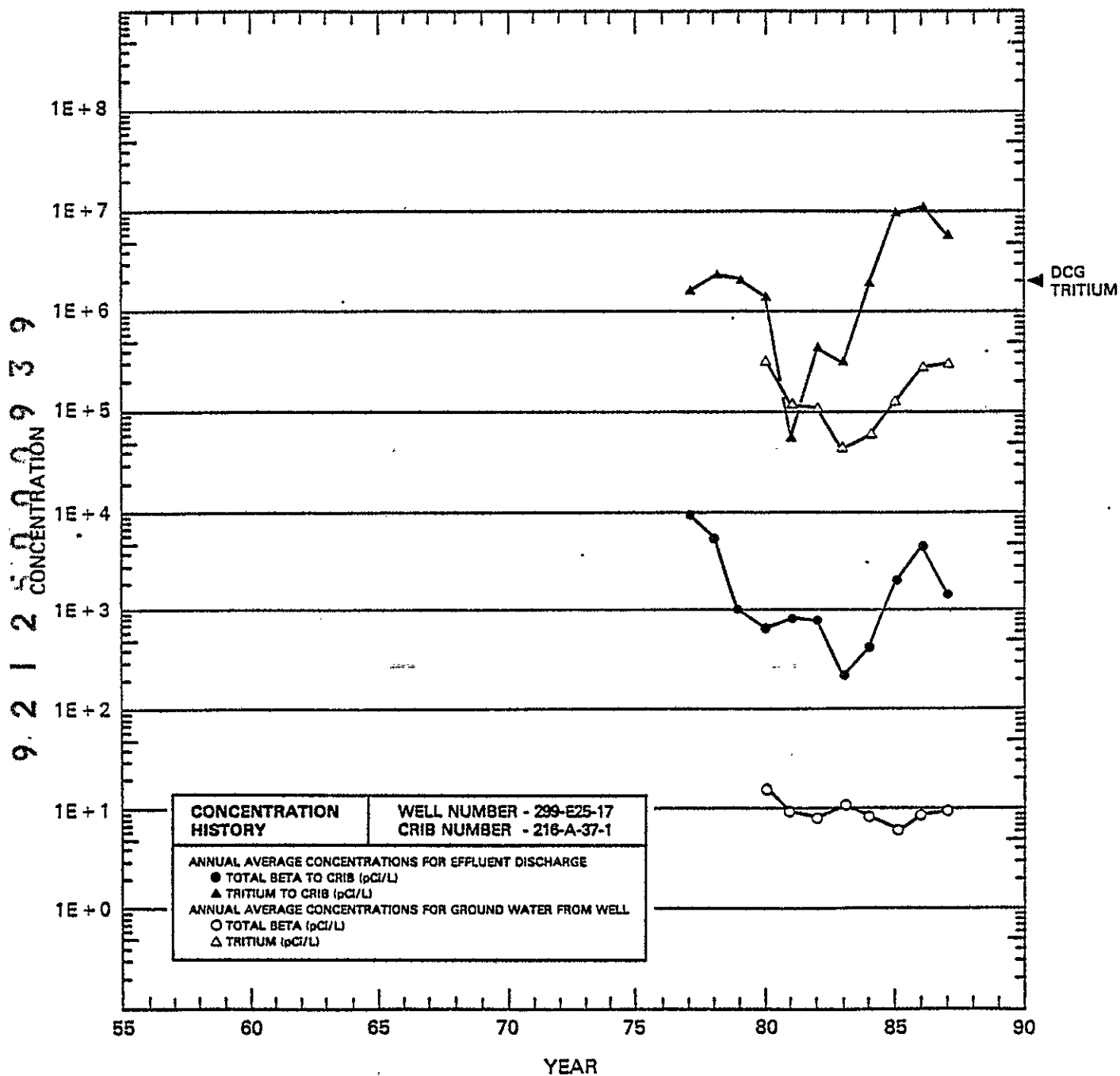


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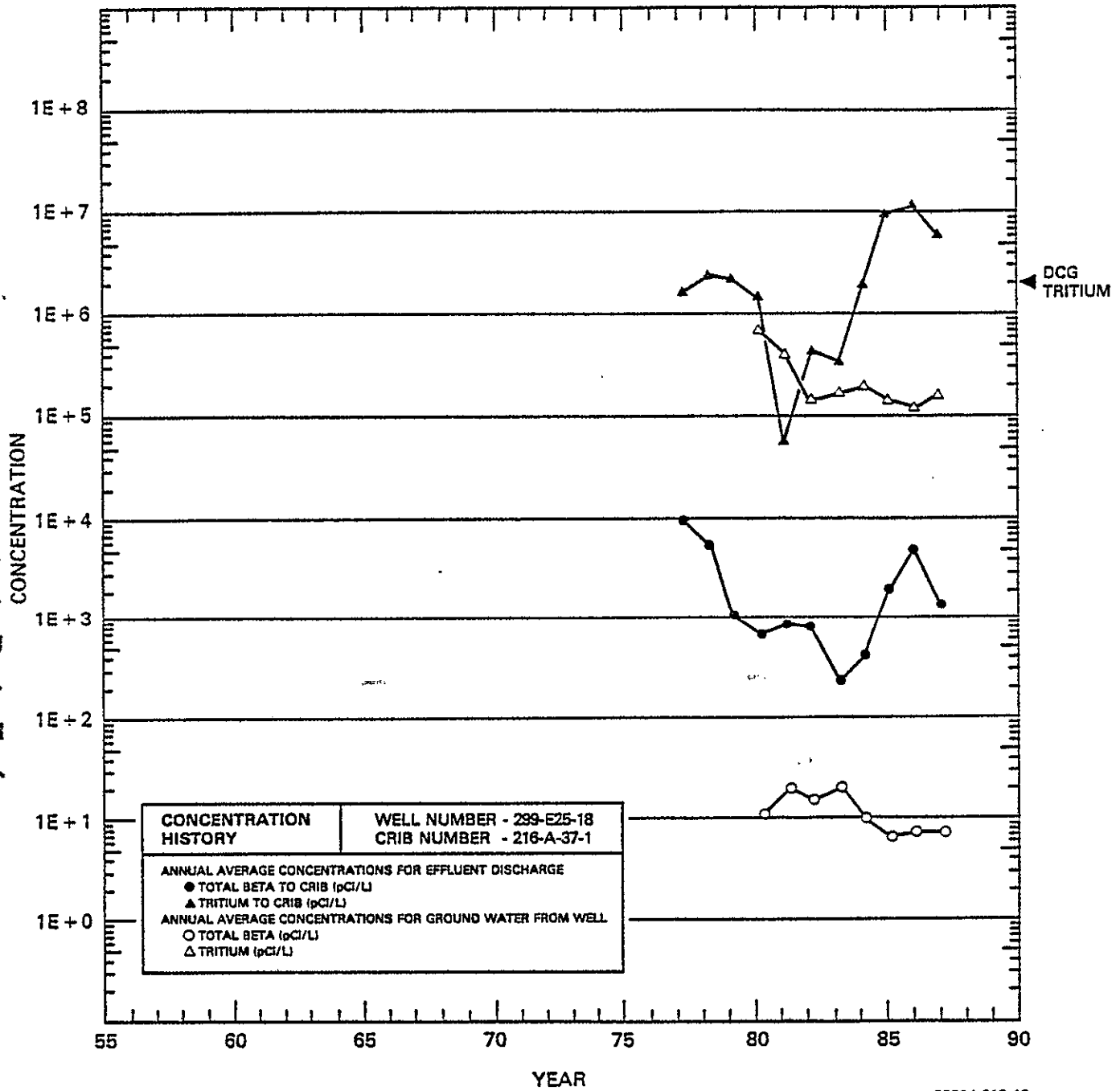


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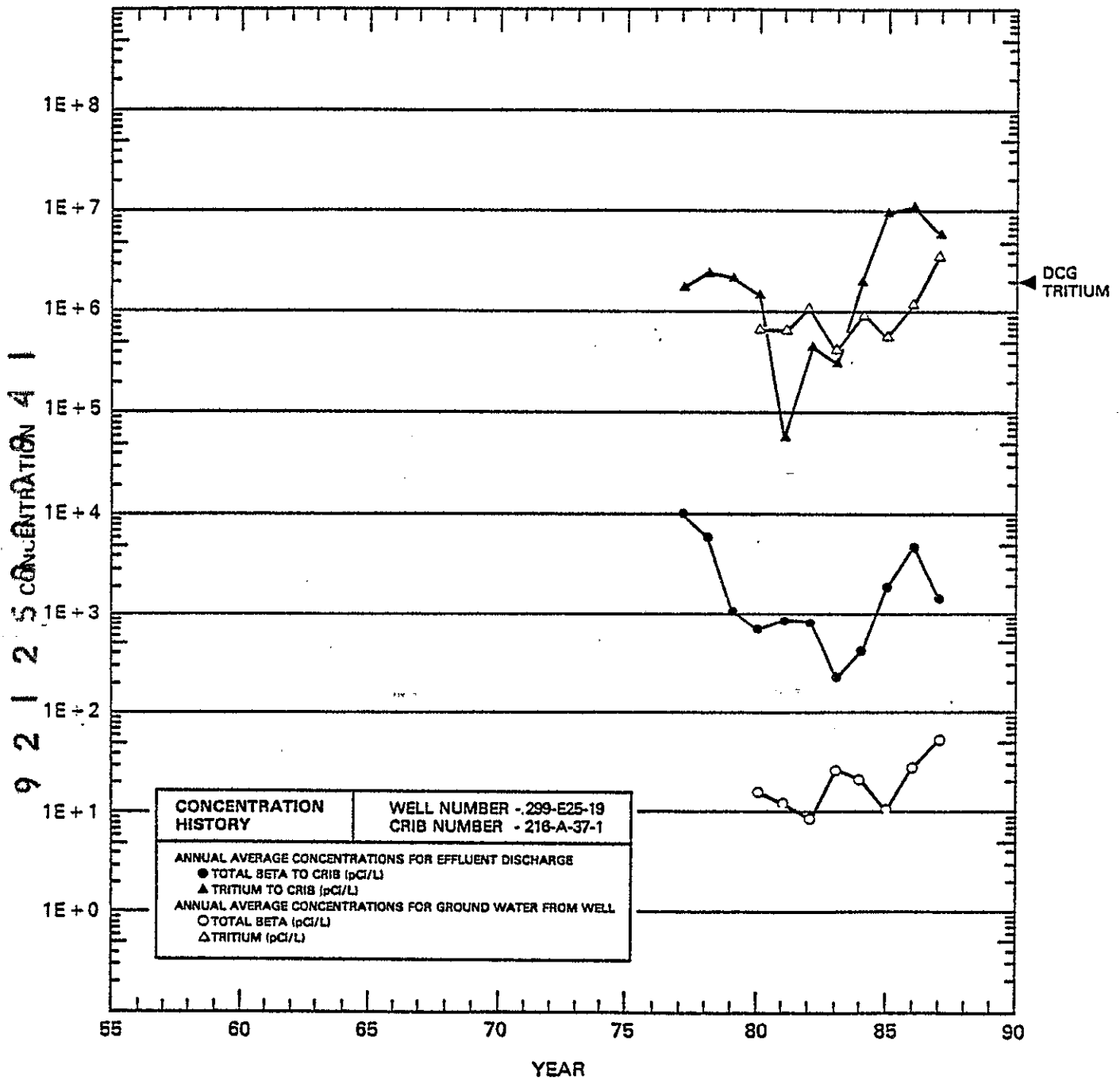


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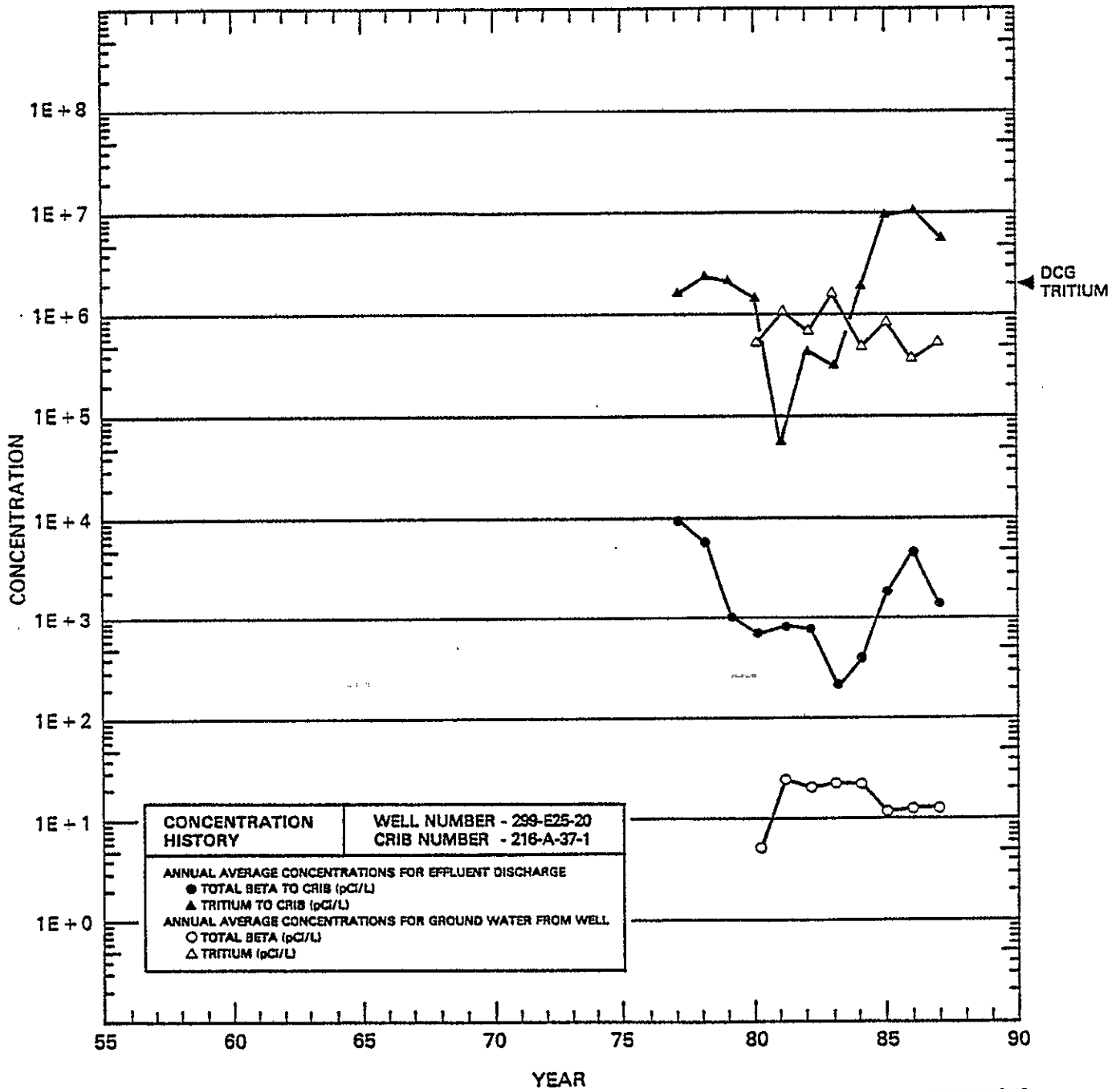
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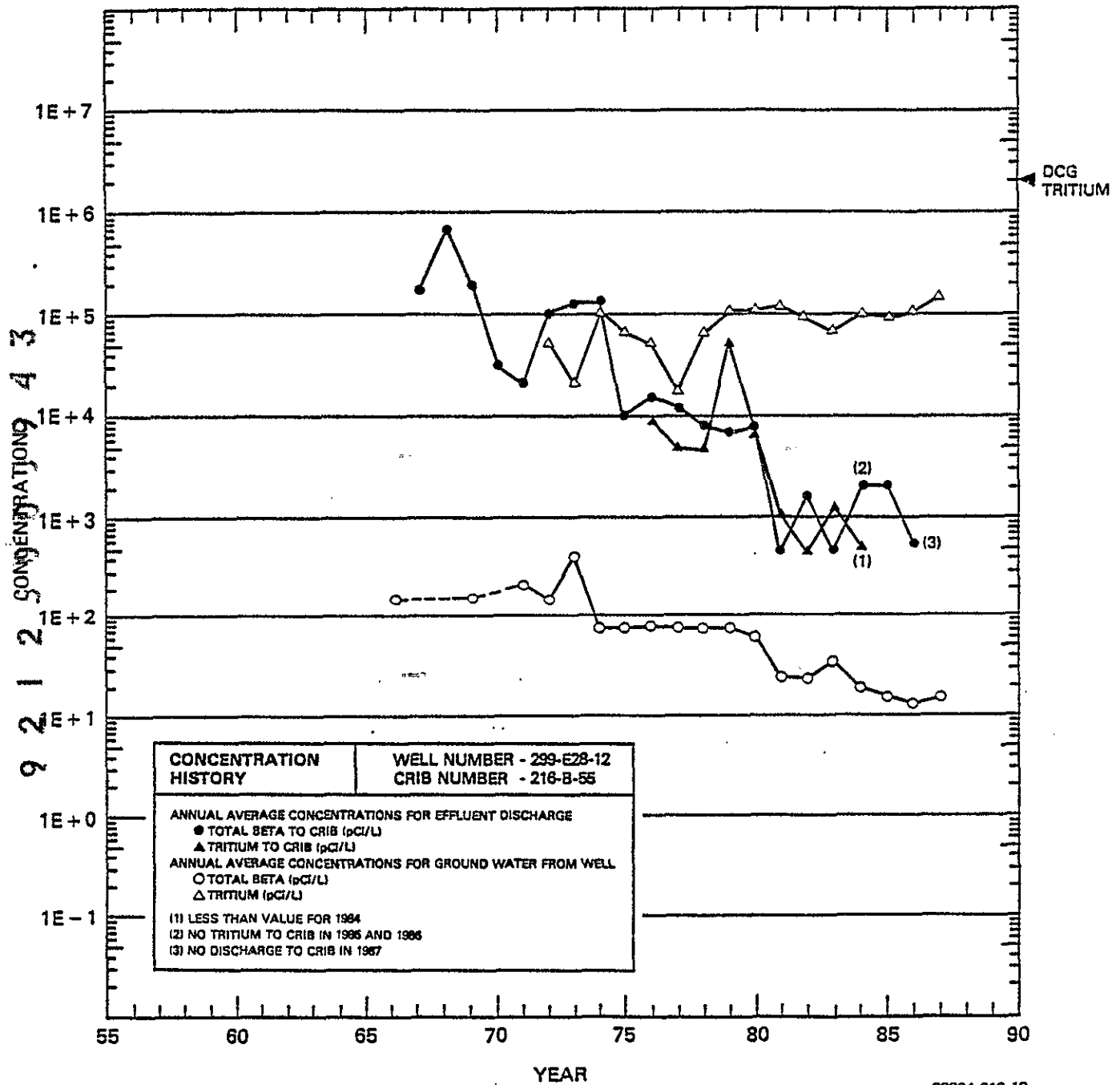
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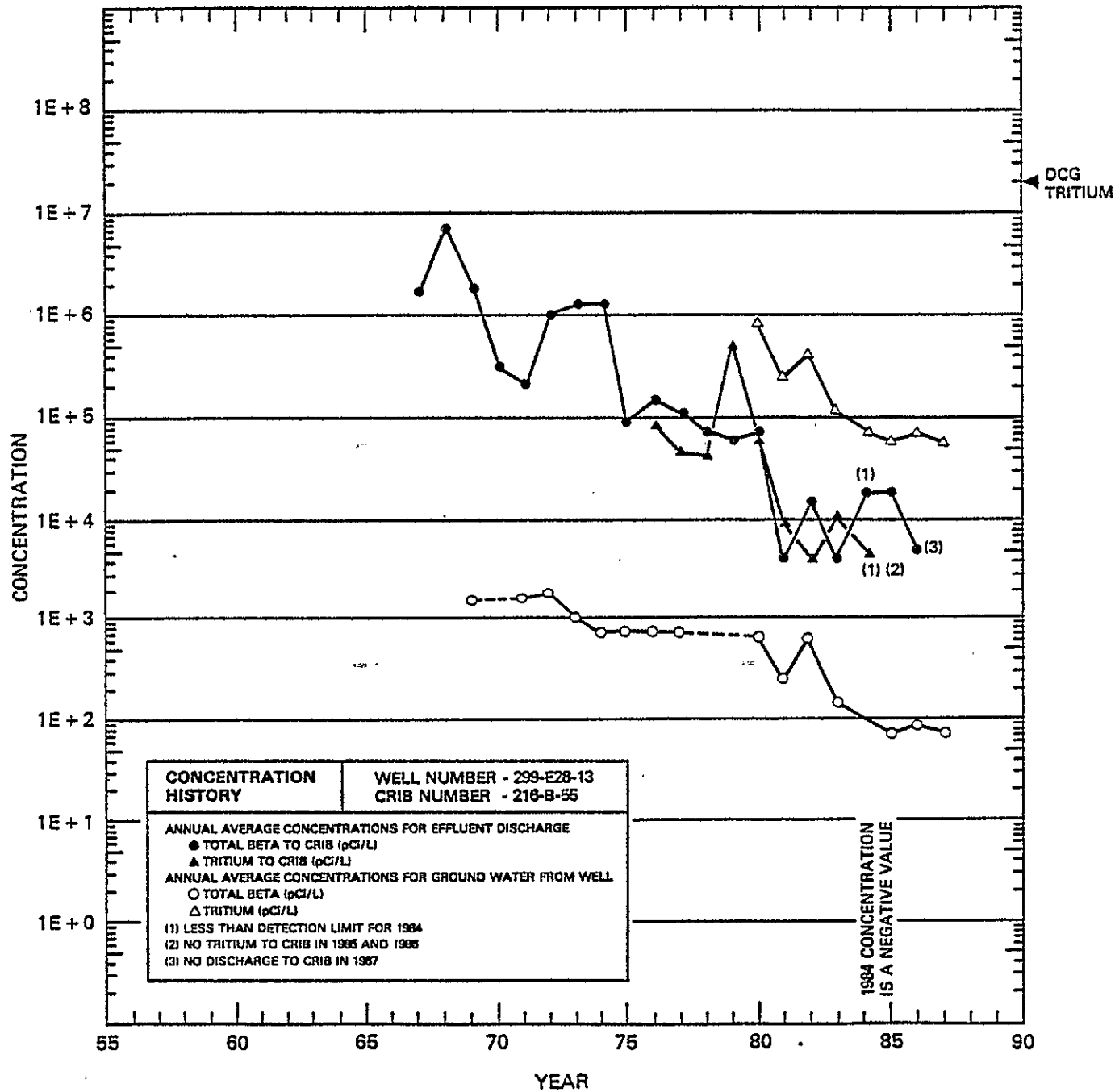
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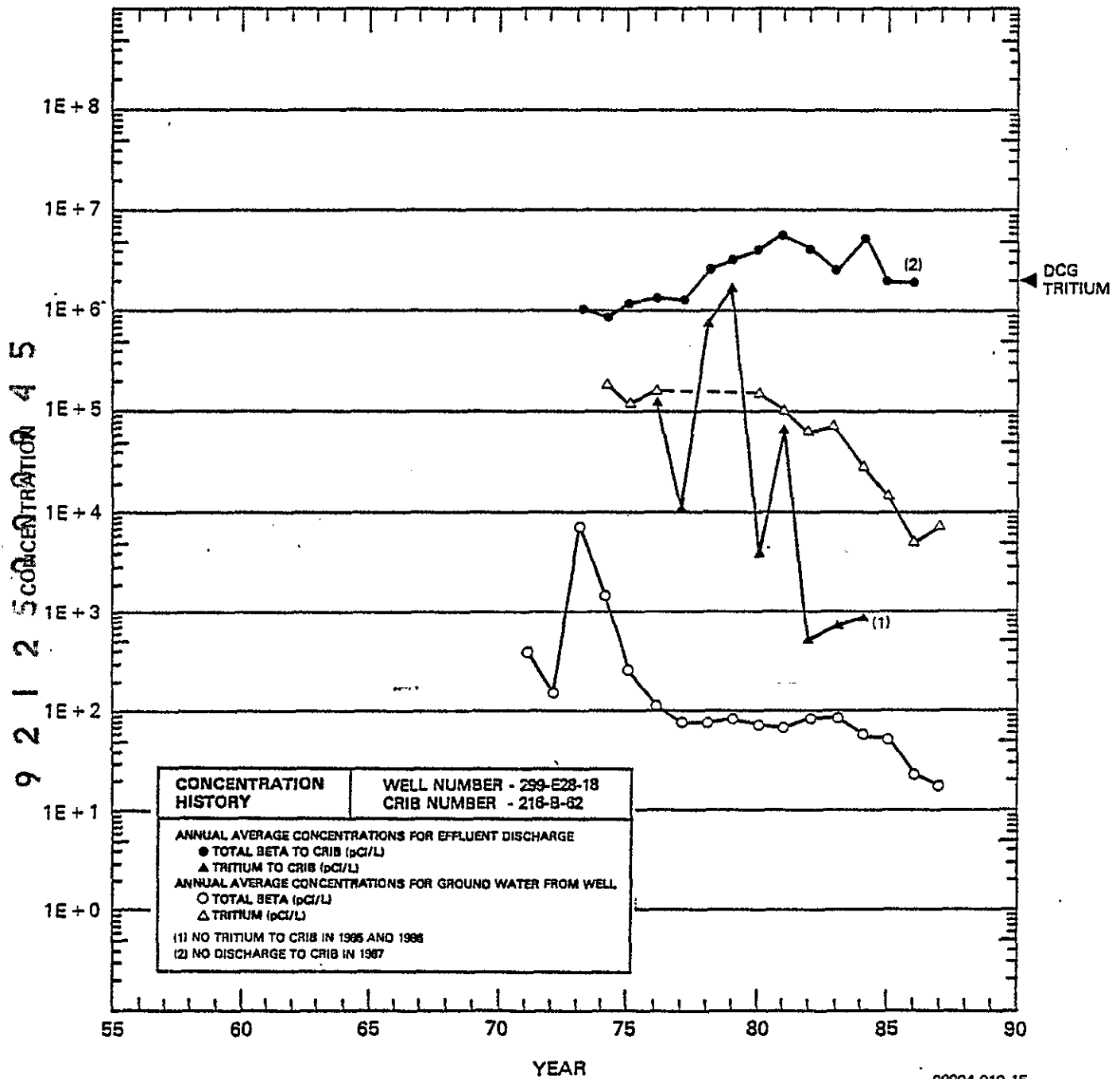
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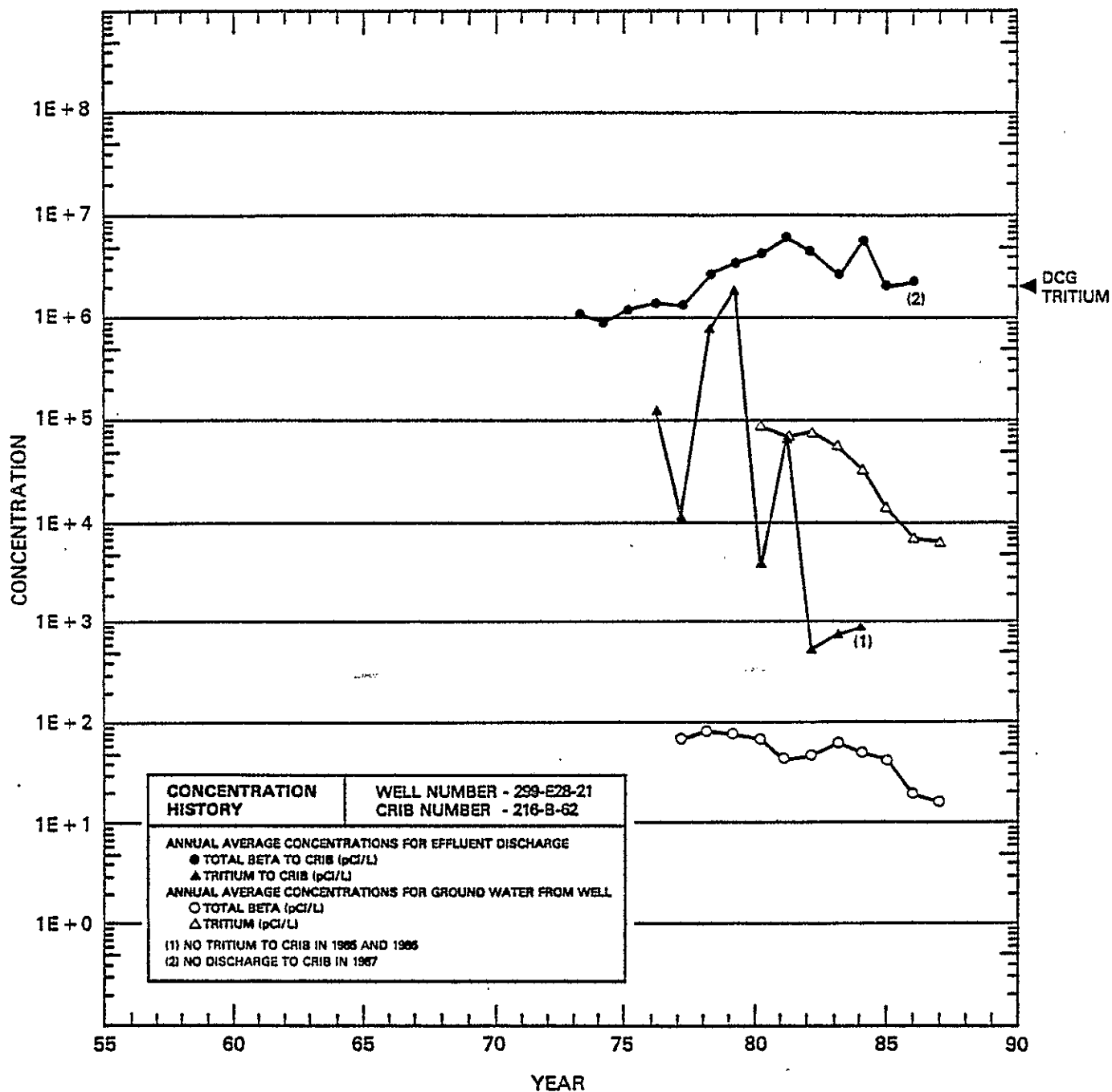
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